

# Acid News

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## Ocean acidification increases the agony of the Baltic Sea

Because of low alkalinity and high primary production, the daily fluctuation of pH in the surface water is already high, and ocean acidification is projected to increase this variation further.

The ever-increasing carbon dioxide ( $\text{CO}_2$ ) concentrations in the atmosphere result in global warming. Yet a significant share of the  $\text{CO}_2$  is also taken up by surface oceans. This buffering effect mitigates climate change, but at the cost of causing ocean acidification (OA), or shifts in the acid-base equilibria of seawater. OA means that the pH of the ocean is decreasing.

This is bad news for marine organisms. The reduced calcium carbonate ( $\text{CaCO}_3$ ) saturation state impairs calcification rates of plants and animals that use carbonate to build their shells and skeletons. OA can also induce other physiological maintenance costs, which can in particular be reflected in growth and survival

at early life stages. While OA can have negative effects on some species, others may benefit from it. Possible beneficiaries include macroalgae due to improved carbon availability

OA is controlled by alkalinity – the buffering capacity – of the water. The higher the alkalinity of the water, the smaller the changes in pH when  $\text{CO}_2$  dissolves in it, and the lower the alkalinity, the larger the changes in pH.

The Baltic Sea is considered to be especially vulnerable to OA because its alkalinity is considerably lower than that of the oceans, although total alkalinity of the surface water has increased over recent decades. The change in alkalinity has been highest in the low-saline northern

# Acid News

A newsletter from the Air Pollution & Climate Secretariat, the primary aim of which is to provide information on air pollution and its effects on health and the environment.

Anyone interested in these matters is invited to contact the Secretariat. All requests for information or material will be dealt with to the best of our ability. Acid News is available free of charge.

In order to fulfil the purpose of Acid News, we need information from everywhere, so if you have read or heard about something that might be of general interest, please write or send a copy to:

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## The Air Pollution and Climate Secretariat

The Secretariat has a board consisting of one representative from each of the following organisations: Friends of the Earth Sweden, Nature and Youth Sweden, the Swedish Society for Nature Conservation, and the World Wide Fund for Nature (WWF) Sweden.

The essential aim of the Secretariat is to promote awareness of the problems associated with air pollution and climate change, and thus, in part as a result of public pressure, to bring about the needed reductions in the emissions of air pollutants and greenhouse gases. The aim is to have those emissions eventually brought down to levels that man and the environment can tolerate without suffering damage.

In furtherance of these aims, the Secretariat:

- ✗ Keeps up observation of political trends and scientific developments.
- ✗ Acts as an information centre, primarily for European environmentalist organisations, but also for the media, authorities, and researchers.
- ✗ Produces information material.
- ✗ Supports environmentalist bodies in other countries in their work towards common ends.
- ✗ Participates in the advocacy and campaigning activities of European environmentalist organisations concerning European policy relating to air quality and climate change, as well as in meetings of the Convention on Long-range Transboundary Air Pollution and the UN Framework Convention on Climate Change.

## Editorial

**Marine areas around** the world face dramatic changes related to the release of greenhouse gases. Some of these changes — such as marine heat waves already proven devastating to coral reefs — are directly related to the temperature regimes experienced by the organisms. In addition, there is a whole list of other changes that occur concurrently.

These changes are not, however, the same in all marine waters, nor are their effects on ecosystems. Coastal areas and regional seas, for instance, often have their own unique characteristics that will shape the way they respond to climate change. The “baseline” of environmental pressures upon which climate-change-related effects operate also differs between regions.

The Baltic Sea provides an example of the importance of regional ecosystem properties in shaping responses to the effects of climate change. These variations in responses apply to the Baltic Sea in comparison with other seas, but also to local differences within the Baltic Sea. In the front-page article of this issue of Acid News, Anu Vehmaa highlights acidification in the Baltic Sea, and describes the unique characteristics of its buffering system, as well as aspects of geographic variation in the buffering system. The importance of variable photosynthetic activity, which can seasonally be extremely high, is also discussed in relation to its implications for pH dynamics.

There are several other examples of environmental changes that are characteristic of the Baltic Sea. Eutrophication is the most notorious one. Eutrophication is evidently not caused by climate change, but by excess nutrients from e.g. unsustainable agriculture practices and burning of fossil fuels. However, due to increased precipitation and warmer winters, the eutrophication problem will get worse unless efforts to cut nutrients are successful. In the wake of increased precipitation, an ongoing freshening (decrease in salinity) is also predicted



to continue, at the expense of marine animals and plants already at the limit of their salinity tolerance levels.

There is also an unfortunate interplay between eutrophication and salinity, namely oxygen depletion. In short, the water column in parts of the Baltic Sea is permanently stratified into a deeper, more saline, layer, and a surface layer of less saline water. As oxygen from the surface cannot penetrate to the deeper layer, oxygen will eventually be depleted from this layer. The rate at which the oxygen is depleted is dependent on the amount

## “Climate operates on different baselines in marine regions”

of organic matter, which increases with increasing eutrophication. In addition to this salinity-dependent stratification, shallower waters also

become stratified in summer, due to temperature-dependent stratification. Unfortunately, increased stratification is one of the projected changes related to climate change. In addition, the ongoing warming of the Baltic Sea is in itself bad news for oxygen conditions, as less oxygen can be bound at higher temperatures, and oxygen consumption increases.

The consideration of regional or local conditions does not prevent universal approaches to protect the marine environment from the effects of climate change. The obvious approach is immediate mitigation of greenhouse gases. Other measures include protection and restoration of biodiversity for increased resilience. However, continued, regionally adopted measures are needed to mitigate other, interacting, stressors, such as eutrophication in the Baltic Sea.

Marko Reinikainen

Further reading: Baltic Sea Environment Proceedings No. 137 (HELCOM; <https://www.helcom.fi/wp-content/uploads/2019/10/BSEP137.pdf>), <https://www.smhi.se/en/research/research-news/climate-change-makes-reducing-eutrophication-even-more-important-1.162273>, and <https://www.bsag.fi/en/baltic-sea/climate-change/>

parts, with the effect decreasing gradually as salinity increases towards the south. So far, the increase in alkalinity has balanced a notable share of the CO<sub>2</sub>-induced acidification. Nevertheless, researchers warn that the increasing alkalinity should not be interpreted as protection against future OA.

In the Baltic Sea, OA is yet another encumbrance among a long list of burdens, eutrophication still being the largest. Due to the combination of low total alkalinity and high primary production, the daily fluctuation of pH in the surface water of the Baltic Sea is already substantial, and OA is projected to increase this variation even more. The largest differences in sea water pH between day and night occur near macroalgal and seagrass beds as well as in phytoplankton blooms. Moreover, progressive eutrophication amplifies the seasonal fluctuation of seawater pH by increasing production and mineralisation. Highly productive coastal habitats that are suffering from hypoxia are already experiencing lower pH values and CaCO<sub>3</sub> saturation states than projected for the coming centuries. Kiel Bay in the western Baltic Sea is an example of such a habitat. At the moment, these areas can be used as model systems when testing the responses of adapted marine ecosystems to high levels of acidification.

It is not easy to detect significant OA trends and draw conclusions about the present situation in the Baltic Sea. Even though the widest monitoring data sets include over a thousand pH observations, the quality of the historical data is partly questionable. At present, there are a few studies reporting significant changes in the Gulf of Finland. Wintertime surface and deep-water pH has decreased there significantly between 1972 and 2009 and between 1979 and 2015, respectively. The decrease has been sharper in deep water than in surface water, possibly because of increased decomposition and CO<sub>2</sub> production caused by eutrophication. Recent modelling studies have projected the same phenomena: climate change and increasing nutrient loads will affect acidification, mainly by modifying seasonal cycles (summer maximum and winter minimum), and deep water conditions. However, the main driver controlling

the magnitude and direction of the future pH trends is the atmospheric CO<sub>2</sub> concentration.

Information on the effect of OA on the Baltic Sea organisms is slowly accumulating. Most studies have been done at the species level, although evidence on community responses has begun to appear in recent years. In the coastal zone, the species studied include bladderwrack (*Fucus vesiculosus*, *F. radicans*) and blue mussel (*Mytilus edulis trossulus* complex). They are both keystone or foundation species in their habitat, and other organisms thus depend on their success. According to the experiments using bladderwrack populations from the Kiel Fjord and the Gulf of Finland, OA may have slightly positive effects on growth in the form of increased carbon availability and storage, but the response is small in comparison, for example, to the effect of warming, and varies between seasons. Regardless, the future seems challenging for the bladderwrack, as summer heatwaves have proven especially detrimental. Climate warming, decreasing salinity, and coastal eutrophication all favour fast-growing filamentous green algae, epiphytes and phytoplankton over bladderwrack. Local or regional actions, such as alleviation of overfishing and eutrophication may mitigate the ongoing loss of the bladderwrack.

Bivalves are dependent on their protective shells and, as calcifying organisms, they are especially vulnerable to OA. According to the recent studies, the benthic life stages are able to compensate for the costs of acidification when food is abundant. The larval stages are less fortunate due to high calcification rates during the formation of the first larval shell and the limited energy provided by the egg. Calcification is energetically costly for the Baltic blue mussel, and the costs increase with decreasing salinity. Projected desalination and OA, and the resulting decrease in CaCO<sub>3</sub> saturation state could thus set a severe constraint for the future of blue mussels.

What can a mussel do in an unfavourable environment? It has been suggested that dense macroalgal or seagrass habitat could offer a temporal refuge from acidification stress. In experimental conditions, blue mussel has been able

to maintain most of its calcification activity by shifting it into the daytime, when the photosynthetic activity of the bladderwrack increases the mean pH of the habitat. Studies using the mussel population from the Kiel Fjord suggest that the Baltic Sea blue mussels might have adaptation potential against the effects of OA because fluctuating environments facilitate the maintenance of high genetic diversity.

The complexity of the Baltic Sea CO<sub>2</sub> system complicates meaningful monitoring of OA. Monitoring must be both spatially and temporally frequent, and be based on highly accurate and precise measurements. Monitoring of Baltic Sea water pH started in 1979 and it is coordinated by the HELCOM COMBINE programme. pH is still the only parameter of the four carbonate buffer system variables (total alkalinity, pH, dissolved organic carbon, pCO<sub>2</sub>) that is measured on a regular basis. According to HELCOM, development of more comprehensive OA monitoring is in progress, and will be in place by 2024.

In essence, OA and global warming have the same cause, so the main remedy for both environmental problems is to cut down the release of CO<sub>2</sub> from burning of fossil fuels. Promoting ecosystem resilience against OA could be achieved through conservation actions that maintain biodiversity by freeing the ecosystems from other environmental stressors, such as eutrophication and overfishing. Our knowledge of the effects of OA on the Baltic Sea ecosystem is still in its infancy. So more research is needed before tackling of the acidification issue can be effectively included in conservation and management plans.

Anu Vehmaa

This article is based on a report from the BALSAM-project, funded by the Swedish Institute. The report will be available under the section "Recent Publications" in Acid News No. 2/2021. A longer version of this article, including references, can be found under the heading "Ocean Acidification Working Group" on <https://www.airclim.org/> (link to the article: <https://airclim.org/ocean-acidification-increases-agony-baltic-sea>). Please note also information on the Ocean Acidification Action Week (May 3–9, 2021) on page 13 in this issue.

## Zero In – CONSTRIN study show green recovery could cut the rate of temperature rise by up to half

With global temperatures now almost 1.2°C above pre-industrial levels, limiting temperature rise to 1.5°C in line with the Paris Agreement means taking urgent and decisive global action. A new report shows that slowing down global warming can be combined with tackling the economic crisis caused by Covid-19 and that a green recovery could cut the rate of temperature rise by up to half. Where are we in terms of the Paris Agreement Long-Term Temperature Goal (LTTG)? The Paris Agreement reflects global, human-induced long-term temperature change that excludes the short-term natural variability in the climate system. Exceeding 1.5°C warming during one or more years as the result of year-to-year variability therefore does not mean that the Paris Agreement LTTG has been reached or exceeded. Measuring where we are now with respect to the LTTG means using the same approach that was used to set it, following the best available science at the time, as set out in the IPCC Fifth Assessment Report (AR5). This includes looking forward from a modern reference period (1986-2005), and so scientific advances in establishing how temperatures changed before this time will not affect our trajectory towards the 1.5°C limit. Overall, reaching or exceeding 1.5°C warming in

a single year, month or location does not mean that the LTTG has been breached, as long as human-induced warming still falls below 1.5°C. It is unlikely that human-induced warming will reach 1.5°C above pre-industrial levels in the next decade.

Integrating hard and fast climate action with Covid economic recovery packages could, over the next 20 years, slow down human-induced global warming by up to half the rate we have experienced since 2000, giving us vital time and space to adapt to future climate impacts. This “strong green recovery”, investing just 1.2% of GDP in green technologies and industries, whilst refusing to bail out fossil fuel companies, could also cut the total amount of warming by 2050, putting us back on track to stay within the LTTG’s 1.5°C limit. Such a green recovery is urgently needed as the carbon budget continues to be depleted despite a record fall in annual CO<sub>2</sub> emissions from 2019 to 2020. The report assesses the remaining carbon budget for staying below 1.5°C to be 355 Gt CO<sub>2</sub> (50% probability).

Compiled by Reinhold Pape

Source:

<https://constrain-eu.org/news/>

<https://constrain-eu.org/wp-content/uploads/2020/12/Constrain-Report-2020-Final.pdf>

<https://climateanalytics.org/projects/constrain/>

CONSTRIN hosted a Special Event at the 2020 UNFCCC Climate Dialogues:

<https://www.youtube.com/watch?v=FHyjOvsbpRg&feature=youtu.be>

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## 100% renewable electricity supply is possible by 2030

The Earth’s climate emergency requires the achievement of a zero-emissions economy much sooner than the generally discussed target year of 2050, according to leading researchers on wholesale energy transitions, some of whom have been researching for almost two decades how we can realise a complex and secure energy supply with 100% renewable energy (RE). The researchers say that the target year for ending CO<sub>2</sub> and other climate-warming and air pollutant emissions should be 2030 for the electric power sector and soon thereafter, but ideally no later than 2035, for other sectors. The core solution to meeting this timeline is to electrify or provide direct heat for all energy needs and provide this electricity and heat globally from 100% RE.

The researchers have summarised their findings in a 10-point declaration. Their main message is: The transformation to 100% renewables is possible and will arrive much faster than generally expected. A 100% renewable electricity supply is possible by 2030, and with substantial political will around the world, 100% renewable energy is also technically and economically feasible across all other sectors by 2035. A 100% RE system will be more cost-effective than will a future system based primarily on fossil and nuclear power. The transformation to 100% renewables will boost the global economy, create millions more jobs than are lost, and substantially reduce health problems and mortality due to pollution.

Compiled by Reinhold Pape

<https://global100restrategygroup.org/>

<https://global100restrategygroup.org/wp-content/uploads/2021/02/Joint-Declaration-of-the-Global-100-RE-Strategy-Group-210208.pdf>





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## UN Secretary General urges all countries to declare climate emergency

Governments around the world should all declare a state of climate emergency until the world has reached net-zero CO2 emissions, the UN Secretary General, António Guterres, told a summit of world leaders in December 2020. At least 38 countries have already declared such a state of emergency, often owing to their vulnerability to the impacts of climate breakdown, which are already being felt. “Can anybody still deny that we are facing a dramatic emergency? I urge all others to follow. The COVID pandemic is an unexpected chance to tackle the climate crisis”, the UN Secretary General declared. “By next month, countries representing more than 65 percent of harmful greenhouse gases and more than 70 percent of the world economy will have committed to achieve net-zero emissions by the middle of the century. At the same time, the main climate indicators are worsening. While the Covid-19 pandemic has temporarily reduced emissions, carbon dioxide levels are still at record highs – and rising. The past decade was the hottest on record; Arctic sea ice in October 2020 was the lowest ever, and apocalyptic fires, floods, droughts and storms are increasingly the new normal. Biodiversity is collapsing, deserts are spreading, oceans are warming and choking with plastic waste. Science tells us that unless we cut fossil fuel production by 6 percent every year between now and 2030, things will get worse. Instead, the world is on track for a 2 percent annual rise. Pandemic recovery gives us an unexpected yet vital opportunity to attack climate change, fix our global environment, re-engineer economies and reimagine our future. Here is what we must do...” (See link below).

## Meeting Paris goals and phasing out fossil fuels could save “millions of lives”

Two new scientific assessments reported by the Guardian say that climate action could save “millions of lives” through clean air, diet and exercise. Research from the Lancet Countdown on Health and Climate Change looked at the health impact of boosting national climate action plans to meet the Paris targets and avoid dangerous climate change across nine countries, including the US, China, Brazil and the UK. The world is currently off track to meet the Paris goals, but the research found that stronger commitments to curb temperature rises in line with the international agreement would also have significant benefits for health. Across all nine countries, implementing national climate plans that meet the Paris goals could save 5.8 million lives due to better diet; 1.2 million lives due to cleaner air; and 1.2 million lives due to increased exercise. Air pollution caused by the burning of fossil fuels such as coal and oil was responsible for 8.7 million deaths globally in 2018, a staggering one in five of all people who died that year, according to a second research study in collaboration between scientists at Harvard

University, the University of Birmingham, the University of Leicester and University College London. Countries with the highest consumption of fossil fuels to power factories, homes and vehicles are suffering the highest death tolls, with the study finding that more than one in 10 deaths in both the US and Europe were caused by the resulting pollution, along with nearly a third of deaths in eastern Asia, which includes China. Death rates in South America and Africa were significantly lower. The death toll exceeds the combined total of people who die globally each year from smoking tobacco and those who die of malaria.

Scientists have established links between pervasive air pollution from burning fossil fuels and cases of heart disease, respiratory ailments, and even the loss of eyesight. Without fossil fuel emissions, the average life expectancy of the world’s population would increase by more than a year, while global economic and health costs would fall by about 2.9 trillion dollars.

Compiled by Reinhold Pape

<https://www.theguardian.com/environment/2021/feb/10/climate-action-could-save-millions-of-lives-through-clean-air-diet-and-exercise>

<https://www.theguardian.com/environment/2021/feb/09/fossil-fuels-pollution-deaths-research>

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<https://www.theguardian.com/environment/2020/dec/12/un-secretary-general-all-countries-declare-climate-emergencies-antonio-guterres-climate-ambition-summit>

<https://www.independent.co.uk/voices/covid-pandemic-climate-crisis-paris-agreement-b1769330.html>



# Improved air quality could save 200,000 lives per year

Reducing urban air pollution in 31 European countries to below the WHO recommended levels could prevent more than 50,000 deaths per year, and if the cities manage to bring down air pollution in line with the lowest measured levels, over 200,000 annual deaths could be prevented.

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**A new health** impact study by the Barcelona Institute for Global Health (ISGlobal) has estimated the mortality burden attributable to air pollution in more than 1,000 cities in 31 European countries (EU-28, Norway, Switzerland and Iceland).

The study, published in *The Lancet Planetary Health*, includes a ranking of the cities with the highest rates of mortality attributable to each of the two air pollutants studied: fine particulate matter (PM<sub>2.5</sub>) and nitrogen dioxide (NO<sub>2</sub>).

The findings show that 51,000 and 900 premature deaths could be prevented each year, respectively, if all the cities analysed were to achieve the PM<sub>2.5</sub> and NO<sub>2</sub> levels recommended by the World Health Organization (WHO).

However, if all of the cities were to match the air quality levels of the least polluted city on the list, even more deaths could be prevented. Specifically, the number of premature deaths that could be prevented each year by reducing PM<sub>2.5</sub> and NO<sub>2</sub> concentrations to the lowest measured levels are 125,000 and 79,000, respectively.

When ranking the cities it was found that the top ten cities with the highest mortality burden due to PM<sub>2.5</sub> were all in Italy, Poland or the Czech Republic (see Table).

“For PM<sub>2.5</sub>, the cities with the highest mortality burden were in Italy’s Po Valley, southern Poland and the eastern Czech Republic. This is because PM<sub>2.5</sub> is emitted not only by motor vehicles but also by other sources of combustion, including industry, household heating,

and the burning of coal and wood,” said researcher Sasha Khomenko, lead author of the study.

The highest rates of mortality attributable to NO<sub>2</sub>, a toxic gas associated primarily with motor-vehicle traffic, were found in large cities in countries such as Spain, Belgium, Italy and France.

On the other hand, the top ten cities with the lowest mortality burden were all in Iceland, Norway, Sweden and Finland, with Tromsø in Norway

**Table: The ten cities with the highest mortality burden attributable to PM<sub>2.5</sub> and NO<sub>2</sub>, respectively.**

	<b>Particulate matter (PM<sub>2.5</sub>)</b>	<b>Nitrogen dioxide (NO<sub>2</sub>)</b>
1	Brescia (Italy)	Madrid (metropolitan area) (Spain)
2	Bergamo (Italy)	Antwerp (Belgium)
3	Karviná (Czech Republic)	Turin (Italy)
4	Vicenza (Italy)	Paris (metropolitan area) (France)
5	Silesian Metropolis (Poland)	Milan (metropolitan area) (Italy)
6	Ostrava (Czech Republic)	Barcelona (metropolitan area) (Spain)
7	Jastrzębie-Zdrój (Poland)	Mollet del Vallès (Spain)
8	Saronno (Italy)	Brussels (Belgium)
9	Rybnik (Poland)	Herne (Germany)
10	Havířov (Czech Republic)	Argenteuil-Bezons (France)

Note: Ranking based on percentage of preventable annual mortality and years of life lost (YLL) per 100,000 population.

reporting the lowest mortality burden associated with NO<sub>2</sub>, and Reykjavik in Iceland the lowest mortality burden associated with PM<sub>2.5</sub>.

“Our findings support the evidence suggesting that there is no safe exposure threshold below which air pollution is harmless to health. They also suggest that the European legislation currently in force does not do enough to protect people’s

health. Therefore, the maximum NO<sub>2</sub> and PM<sub>2.5</sub> levels allowed by law should be revised,” said Mark Nieuwenhuijsen, senior author of the study.

“We need an urgent change from private motorised traffic to public and active transportation and a reduction of emissions from industry, airports and ports,” Sasha Khomenko said to Agence France Presse, adding that a ban on domestic wood and

coal burning would help heavily polluted cities in central Europe.

Christer Ågren

Source: ISGlobal press release, 19 January 2021.

The study: “Premature mortality due to air pollution in European cities: a health impact assessment”, by S. Khomenko et al. The Lancet Planetary Health. [https://doi.org/10.1016/S2542-5196\(20\)30272-2](https://doi.org/10.1016/S2542-5196(20)30272-2)

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## Bulgaria and Greece to go to court for air quality breaches

In its December infringements package, the European Commission announced that it will refer Bulgaria and Greece to the EU Court of Justice (ECJ) after both countries breached air pollution limits for years despite multiple warnings.

Bulgaria has systematically and continuously failed to comply with the limit values for particulate matter (PM<sub>10</sub>) and to adopt appropriate measures to keep the period of exceedance as short as possible, the Commission said.

As Bulgaria has failed to comply with a 2017 ruling of the ECJ, the result may be financial penalties for the time elapsed since the first judgement and daily fines until full compliance is achieved.

Greece will face the court for the first time for breaching limits on PM<sub>10</sub> in Thessaloniki for most of the past 15 years. The Commission concludes that efforts by the Greek authorities have to date been unsatisfactory and insufficient.

A letter of formal notice was sent to France for not respecting a 2019 ECJ judgment on compliance with nitrogen dioxide (NO<sub>2</sub>) limits in 12 air quality

zones and agglomerations. Continued failure to do so could lead to fines.

Source: European Commission infringement package, 3 December 2020.

Link: <https://ec.europa.eu/commission/press->

## Hungary breached EU air pollution limits

The EU Court of Justice (ECJ) ruled in February that Hungary has “systematically and persistently” breached legal limits for PM<sub>10</sub>, in some regions for as long as 12 years. The court also said that, since 2010, Hungary had failed to ensure that breaches were kept as short as possible. The ruling orders Hungary to comply or face potential further legal action by the Commission to impose financial penalties.

The judgment from the Court of Justice on Wednesday puts Hungary on a list of nine EU countries found guilty of illegal air pollution since 2011. Romania, Bulgaria, Portugal, Italy, Poland, Slovenia and Sweden all breached PM<sub>10</sub> limits, while France had illegal levels of NO<sub>2</sub>.

Source: Reuters, 3 February 2021.

Link to ECJ press release: <https://curia.europa.eu/jcms/upload/docs/application/pdf/2021-02/cp210012en.pdf>

## Domestic wood burning biggest PM emitter in the UK

Domestic wood burning has become the single biggest source of small-particle (PM<sub>2.5</sub>) air pollution in the UK, producing three times more than road traffic, according to new emission inventory data.

According to a separate government-commissioned report, the wood-burning pollution is caused by only eight per cent of the population. Almost half of these were affluent and many chose a fire for aesthetic reasons, rather than heat.

In 2019, the use of wood in domestic combustion activities accounted for 38 per cent of PM<sub>2.5</sub> emissions. Emissions of PM<sub>2.5</sub> from domestic wood burning more than doubled between 2003 and 2019 (from 20 to 41 thousand tonnes) and increased by 1.0 per cent between 2018 and 2019.

Industrial combustion and processes are another major source, together accounting for 33 per cent of PM<sub>2.5</sub> in 2019. Road transport remains a significant source of PM<sub>2.5</sub> emissions (12 per cent in 2019). Due to stricter emissions standards, vehicle exhaust emissions have decreased by 85 per cent over the last 25 years, but this has been partially offset by an increase in non-exhaust emissions (e.g. brake, tyre and road wear) as traffic activity has increased.

Source: Guardian, 16 February 2021.

Link to UK emissions inventory report: <https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-1970-to-2018-summary>

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# EU Clean Air Outlook

The annual health benefits of additional measures needed to achieve the 2030 national emissions ceilings are estimated at €12–43 billion, up to 31 times higher than the estimated costs.

**The number of** premature deaths due to air pollution will be reduced by more than half in 2030 compared to 2005, provided that EU countries implement all air pollution and climate measures in existing EU legislation, according to a new analysis published by the European Commission. The report also stresses that more could be done, as there are still plenty of measures for reducing air pollution that would bring more benefits than costs to society.

Published on 8 January 2021, the Second EU Clean Air Outlook report looks at the prospects for EU air quality up to 2050. It follows on from the 2013 Clean Air Programme proposal for a regular update of the air quality situation in the EU, and builds on an analysis prepared by the Commission’s consultant IIASA. The First Clean Air Outlook was published in June 2018.

The NEC directive requires each member country to cut emissions of five major air pollutants in two steps, by 2020 and by 2030. The pollutants covered are sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), non-methane volatile organic compounds (VOC), ammonia (NH<sub>3</sub>) and particulate matter (PM<sub>2.5</sub>).

The study analyses the effect of new measures to reduce air pollutant emissions from different sources put in place since the First Clean Air Outlook, including measures reported in the member states’ National Air Pollution Control Programmes (NAPCP) and changes resulting from the 2018 updated EU energy and

climate policy. Improvements made over the last few years in the national emission inventories are also accounted for. However, the most recent proposal by the Commission, to increase the EU’s climate ambition by reducing greenhouse gases by 55% by 2030, is not part of the baseline scenarios in the analysis, but is reflected as a separate policy scenario.

## Emission scenarios

Based on the above-mentioned information, two new baseline emission scenarios were produced, one business-as-usual, called “CAO2”, and one that includes the additional measures and policies envisaged in the reported NAPCPs, called “NAPCP” (see AN 3/20, pp. 24–25). The resulting emissions in 2030 under these baseline scenarios show whether countries are on track to meet the 2030 emission reduction requirements (ERR) of the NEC directive or not. Changes in total EU-27 emissions for the various scenarios are shown in Table 1 (country-by-country figures can be found in the report).

It was shown that for both scenarios only a handful of countries will have to take additional measures to meet their emission ceilings for SO<sub>2</sub>, NO<sub>x</sub>, VOCs and PM<sub>2.5</sub>. For NH<sub>3</sub>, on the other hand, the analysis showed that additional measures would be needed for most member states to meet their emission ceilings.

The scope of air pollutant emission reductions that could be achieved through full application of available technical

emission control measures is illustrated in alternative scenarios, called “MTFR”. These scenarios should however be seen as conservative, as they exclude premature scrapping of existing capital stock and assume no further technological progress up to 2050.

To explore the impacts of additional climate policy scenarios, two decarbonisation scenarios, called “1.5 TECH” and “1.5 LIFE” were analysed. Both scenarios are designed to achieve net-zero greenhouse gas emissions by 2050.

## Impacts

After full implementation of the emission reduction requirements of the NEC directive, the share of the EU population exposed to PM<sub>2.5</sub> concentrations above the World Health Organization’s (WHO) guideline of 10 µg/m<sup>3</sup> is expected to drop significantly, to around 12 per cent in 2030. Cases of premature deaths due to excessive levels of PM<sub>2.5</sub> and ozone would come down by 56 per cent, from 409,000 in 2005 to 180,000 in 2030.

In the MTFR scenario, the share of the EU population exposed to PM<sub>2.5</sub> concentrations above the WHO’s guideline would be reduced to 4 per cent, and cases of premature deaths due to PM<sub>2.5</sub> and ozone would come down to 148,000 in 2030.

But smaller improvements are expected for ecosystems, especially for impacts on biodiversity resulting from an oversupply of airborne nitrogen compounds. In 2005 around 76 per cent (470,000 km<sup>2</sup>) of the EU’s protected ecosystem area was exposed to excess nitrogen deposition. By 2030, this figure is expected to come down only by approximately one quarter, to 359,000 km<sup>2</sup>, equivalent to 58 per cent of Natura2000 nature protection areas. The main reason for this limited improvement is the NEC directive’s significantly lower ambition level for reducing ammonia emissions from agriculture.

**Table 1. Total EU-27 emissions in 2005 (kilotons); National emission reduction commitments for 2030; Changes in emissions by 2030 under three scenarios.**

	2005	2030	2030 scenarios		
			NECD	CAO2	NAPCP
SO <sub>2</sub>	6803	-78%	-85%	-85%	-90%
NO <sub>x</sub>	9673	-61%	-70%	-70%	-73%
VOC	7565	-41%	-48%	-49%	-64%
PM <sub>2.5</sub>	1665	-50%	-60%	-61%	-74%
NH <sub>3</sub>	3790	-19%	-8%	-19%	-37%



## Costs

Implementing the policies and measures announced by member states in their NAPCPs is estimated to cost about €1.4 billion per year in 2030, and the annual costs for implementing all the available technical measures (MTFR) is estimated at about €25.6 billion in 2030.

## Monetised benefits

Total annual health costs of air pollution in 2005 have been estimated to amount

to €713–2005 billion in the EU. By 2030, full implementation of current legislation is expected to reduce these costs by more than 50 per cent.

The incremental annual health benefits resulting from additional measures of the NAPCPs amount to €11.8–42.7 billion, while those of implementing all the available technical measures (MTFR) amount to €63–226 billion.

For various reasons some of the health benefits from less air pollution exposure

were not included in this valuation. This applies, for example, to reduced damage to health from nitrogen dioxide (NO<sub>2</sub>) exposure and impacts identified on dementia, obesity and diabetes.

Air pollution damage to crops, forests, ecosystems and materials was estimated to amount to €44–53 billion in the EU in 2005, and the incremental annual monetised benefits of implementing the NAPCPs and the MTFR in 2030 were estimated at €0.3–0.9 billion and €2.3–4.2

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**Table 2. Comparison of incremental annual costs and benefits for the EU-27 in 2030 of two of the scenarios analysed (million euro).**

	NAPCP	MTFR
<b>Median VOLY</b>		
Benefits	12,678	67,296
Costs	1,349	25,629
Net benefits	11,329	41,667
Benefit-to-cost ratio	9.4	2.6
<b>Mean VSL</b>		
Benefits	43,570	230,332
Costs	1,349	25,629
Net benefits	42,227	204,703
Benefit-to-cost ratio	32.3	9.0

Note: Specifically for mortality impacts, a lower and a higher value were used, the former being based on the value of a life year lost (VOLY) and the latter on the value of a statistical life (VSL). Scenarios analysed (million euro).

billion, respectively. Figures in Table 3 include benefits to health and to crops, forests, ecosystems and materials.

It should be noted that the benefit analysis was limited geographically to the EU's 27 member countries, which means that no allowance was made for the positive effects of reducing emissions in the EU on health and the environment in non-EU countries.

## Links to climate policy

By avoiding the need to undertake some air pollution abatement measures, climate mitigation actions taken under the scenarios "1.5 TECH" and "1.5 LIFE" result in cost savings for air pollution control.

Of the climate scenarios, the one that reflects a move towards a circular economy and lifestyle change contributes most to reducing air pollutant emissions. The best measures are those that boost energy efficiency, increase the share of non-combustible renewables, improve the energy performance of buildings and

promote more sustainable heating and cooling solutions, as well as measures in support of clean transport. But measures that increase the combustion of bioenergy, especially in devices without adequate emissions abatement technologies, are said to be detrimental to clean air and need to be avoided.

Methane, black carbon and ozone are of concern both for air quality and climate change, and the Commission "underlines the need to continue working on reducing emissions of air pollutant precursors, particularly methane." It also said that the review of the NEC Directive (due by 2025) will explore the possible inclusion of methane among its regulated pollutants.

## Next steps

The Commission concludes that ammonia emissions from agriculture remain an outstanding issue, and that "the additional measures announced by member states in their NAPCPs need to be implemented without delay to reduce these emissions,

and even more measures need to be introduced in many member states."

EU Environment Commissioner Virginijus Sinkevicius said that it is "paramount that all member states fully implement the agreed and planned measures and step up efforts to tackle emissions. Further reducing air pollution would save more lives, reduce pressure on ecosystems and it makes economic sense."

Christer Ågren

Sources:

The Second Clean Air Outlook. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2021)3 (8 January 2021).

Support to the development of the Second Clean Air Outlook. Main report + annex. IASA. (December 2020).

The reports are available at: [http://ec.europa.eu/environment/air/clean\\_air/outlook.htm](http://ec.europa.eu/environment/air/clean_air/outlook.htm)

# Renewables have reduced environmental pressures in EU

A new study shows that the increase in renewable electricity has reduced the EU's climate change impact as well as land, air and water pollution. Targeted actions will further reduce environmental impacts of the energy transition.

**The European Green Deal** puts climate change mitigation at the core of its endeavours to sustainably recover from the Covid-19 pandemic. By 2030, 70 percent of electricity should be generated from renewable sources to enable the necessary reductions in greenhouse gases by 2050.

The European Environment Agency (EEA) has investigated the impact which this transition will have in a wider focus. The study assessed the impact of all electricity generation technologies on climate change, freshwater eutrophication and ecotoxicity, particulate matter formation,

acidification of soils and land occupation.

Going beyond climate mitigation, a detailed life-cycle analysis was undertaken to calculate global changes in overall environmental impacts associated with the trends in the EU power mix between 2005 and 2018. The aim was to estimate how key environmental impacts had changed by 2018, thanks to the increase in renewable sources in the electricity supply mix across the EU, relative to the benchmark year 2005.

EEA studied 16 power generation methods, of which coal, natural gas and oil had the biggest life-cycle impacts on the environment. EEA energy and environment expert Mihai Tomescu stated that "Coal generation has by far the highest impact intensity overall, leading to most impacts across the categories that we looked at and across all years". The majority of the EU's electricity is now free from coal, and some EU countries, most recently Portugal, have pledged to close coal plants. However, other member states, like Poland, still have no date set for when they will finish using coal.

The increase in renewable electricity generation had significantly decreased life-cycle greenhouse gas emissions at the EU level. In fact, for most of the impact categories investigated, the switch from fossil fuel to renewable electricity sources resulted in clear improvements in 2018, compared with 2005. At the EU level, the life-cycle impact potentials of eutrophication, particulate matter formation and acidification were all lower in 2018 than in 2005.

Freshwater ecotoxicity and land occupation are the two exceptions to that trend, the EEA notes. The life-cycle impact intensities of these are more evenly spread across renewable and non-renewable sources. Increasing rates of household



waste incineration, which counts as a renewable electricity source, have increased the potential for freshwater ecotoxicity, while sourcing more power from “solid biomass”, such as wood, has almost doubled the amount of land area needed by the sector since 2005.

In addition, the study highlights that there are ways to decrease the relative and total impact intensities of renewables. The relatively high impact intensity of solar photovoltaics (PV) on ecotoxicity arises from emissions of mining processing metals and chlorine from the purification of solar-grade silicon. This impact can be decreased by reducing demand for raw materials, for example through better end-of-life material recovery.

Considering the worldwide surge in PV deployment and an average lifetime of 30 years for solar panels, waste volumes are certain to increase more rapidly after 2030. End-of-life recycling will help finance the future of the solar power industry. Pleasingly, progress in this field has been rapid and some processes claim recovery rates as high as 99 percent for the raw materials employed in solar panel manufacture.

Solar PV power’s greenhouse gas impact intensity is also among the highest of all renewable sources across the value chain. As the construction of solar PV modules requires both heat and electricity, and takes place globally, the cumulative effect leads to relatively high total emissions of greenhouse gases. Increasing reliance on renewable energy in manufacturing processes would help to bring down the

emission intensity of solar PV components.

For biodegradable municipal solid waste, almost all ecotoxicity impact potentials arise from the incineration process itself. This means there are potential opportunities to mitigate impacts by adopting more advanced abatement technologies. Similarly, for particulate matter formation linked to biomass fuels, process emission contributions are highest during burning, indicating a potential to install further emission control measures.

Green MEP Jutta Paulus called on the European Commission to “further minimise the negative impact of renewables” when it amends key energy and waste legislation this year. She added: “It is intolerable that member states are cutting down forests to make their carbon footprint appear better than it is. That’s why we need science-based targets for sustainable biomass use.”

Demand-side management to reduce the need for standby generation during peak consumption, measures to improve energy and resource efficiency across end use sectors, and more sustainable, circular business models could further reduce some of the potential negative impacts associated with the transition to renewable power supplies, while simultaneously increasing their cost-effectiveness. For non-combustible power sources, measures also include lifetime extensions to reduce the emission intensity linked to upstream and downstream processes.

Wendel Trio, director of Climate Action Network (CAN) Europe, commented: “Strongly reducing energy consumption and

substantially increasing renewable energy are a must for a net-zero energy system and this study underlines the benefits of this transition for our climate and our economy, while proposing ways to mitigate potential negative environmental impacts of renewables.” Trio added that “Renewable projects are set to grow. Hence, we need the right framework to steer investments in renewables in the coming years while ensuring that we opt for the most sustainable deployment of renewables in Europe. Climate, energy and biodiversity policies should reinforce each other.”

Overall, the study makes clear that the shift away from coal power, by far the most environmentally destructive way of producing electricity, and towards renewables and natural gas explains the improvements in the sector’s impact.

Emilia Samuelsson

Sources:

EEA, 2021, EU renewable electricity has reduced environmental pressures; targeted actions help further reduce impacts, European Environment Agency Briefing no. 32/2020, accessed 30 January 2021.

Pickstone, S. (2021). EEA highlights multiple green benefits of renewables. Accessed 31 January 2021, <https://www.endseurope.com/article/1704836/eea-highlights-multiple-green-benefits-renewables>

Taylor, Kira (2021). Shift to renewables ‘significantly decreased’ emissions, EU agency says. Accessed 31 January 2021. <https://www.euractiv.com/section/energy/news/shift-to-renewables-significantly-decreased-emissions-eu-agency-says/>

## Major emitters of air pollution often overlooked

A new study compared the public perception of air pollution sources with the real-world situation. This was done through a survey carried out in seven European countries (Austria, Belgium, Germany, Italy, Poland, Sweden and the United Kingdom) and involving more than 16,000 respondents, in which they could choose two main sources/sectors considered as primarily responsible for air pollution out of a list of six options

(agriculture, industry, transportation, domestic heating, domestic waste and others).

The top choices by respondents were industry and traffic. But the reality is very different. The main source of particle pollution in six out of the seven countries is agriculture, but this is frequently overlooked since agriculture emits little particle pollution directly. However, ammonia emissions from livestock and fertiliser react in the atmosphere to produce so-called secondary particles.

Domestic solid-fuel burning for home

heating was also ranked low in people’s perceptions, but it is a significant source in all seven countries, especially in Poland and Italy.

The researchers concluded that better communication between scientists, politicians, the media and the public is needed.

Source: The Guardian, 15 January 2021

Link to the study “Public perception of air pollution sources across Europe”: <https://doi.org/10.1007/s13280-020-01450-5>



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## EU countries falling short of air pollution targets

All but two EU member states have failed to show how they will cut air pollution to comply with the National Emission Ceilings Directive, a troubling new report finds.

A new study by the European Environmental Bureau (EEB) has analysed progress by member states towards compliance with the National Emission Ceilings (NEC) Directive, which aims to halve the impact of air pollution on people's health by 2030.

When the NEC Directive was adopted in 2016, EU member state governments promised to reduce their emissions of five major air pollutants in two steps, by 2020 and 2030, and to put in place National Air Pollution Control Programmes (NAPCPs) outlining how those objectives will be achieved.

The reporting deadline for the first NAPCPs was 1 April 2019, but 20 countries failed to submit their national air pollution control programmes by this date and, over a year and half later, Greece, Luxembourg and Romania have still not

delivered their programmes and Italy has only submitted a draft.

On top of the delays, the report highlights shortcomings and failures regarding the completeness of national reporting, the credibility of the national programmes, and public participation.

Moreover, the analysis shows that only two EU countries (Belgium and Slovakia) appear to be on track to comply with their first-step emission reduction commitments (ERCs) for 2020–29, and only one (Belgium) with the second step ERCs for 2030. The remaining countries are judged to be either at a medium or high risk of non-compliance for all pollutants, with more than half of the member states at high risk of non-compliance for 2030 onwards.

“With our health and environment at stake, it is a scandal that all but two

member states have fallen so short of their commitments to reduce air pollution over this critical decade,” said the EEB’s Senior Policy Officer for Air and Noise, Margherita Tolotto. “We call on the European Commission to start infringement procedures against all the member states which have failed to submit a credible programme, and to ensure that all plans are fit for purpose.”

In November, the European Environment Agency (EEA) confirmed air pollution remains the biggest environmental health risk in Europe, causing around 400,000 premature deaths per year in the EU (see AN 4/20, pp. 18–19). Although some effective measures have been rolled out in the road transport and energy sectors, emission reductions are way too slow, especially when it comes to agriculture and domestic heating.



Source: EEA, 10 December 2020.

The EEA briefing “Measures to reduce emissions of air pollutants and greenhouse gases: the potential for synergies” is available at: <https://www.eea.europa.eu/themes/air/air-pollution-sources-1/national-emission-ceilings/actions-to-reduce-air-pollutant>

Agriculture stands out in particular as the sector governments were afraid to tackle, where reduction targets for ammonia emissions are most likely to be missed. This is especially worrying as emissions from farming have increased in recent years.

For the EEB’s Secretary General, Jeremy Wates, “this points to a big problem with the governance around agriculture at the EU level.”

“Agriculture is not only a significant source of air pollution, but also the single biggest driver of biodiversity loss in Europe, and it accounts for 10–15 per cent of the EU’s contribution to climate change. Yet the sector is not effectively addressed, and the way the CAP negotiations are going is looking pretty bad,” Wates warned.

Domestic heating is also a key sector to address if governments are to respect the reduction targets for fine particles (PM<sub>2.5</sub>), which is one of the most hazardous air pollutants.

The EEB report explores what went wrong and provides tools and recommendations to rectify the dire situation, including the steps to be taken and measures to be included by member states when preparing appropriate NAPCPs.

“We ask national governments to tackle air pollution with the urgency it deserves, by putting in place the necessary national programmes and sticking to them. As many of them prepare their National Recovery and Resilience Plans, air quality must be a priority,” said Tolotto.

The European Commission is requested to enforce a quick resubmission of NAPCPs for those member states that were found to have a high risk of non-compliance in the Commission’s assessment, and to propose additional EU-wide actions that could help improve the situation, in particular to reduce agricultural ammonia emissions.

Christer Ågren

Sources: EEB press release and META article, 18 December 2020.

The report “National Air Pollution Control Programmes: analysis and suggestions for the way forward” is available at: <https://eeb.org/library/national-air-pollution-control-programmes-analysis-and-suggestions-for-the-way-forward/>

## Close links between air pollution and climate action

Actions taken to reduce emissions of air pollutants and greenhouse gases often address the same economic sectors but are reported separately under different EU legislation.

A new briefing from the European Environment Agency (EEA) presents an overview of the latest policies and measures reported by member states to tackle air pollution, and also looks at synergies with the policies reported under the EU Regulation on a mechanism for monitoring and reporting greenhouse gas emissions (Monitoring Mechanism Regulation), highlighting the importance of coherence between these domains.

### Ocean Acidification Action Week initiated by the BALSAM-project, 3-9 May 2021

Ocean Acidification (OA) caused by carbon dioxide from the burning of fossil fuels puts our seas at danger. Corals, cod, salmon, shrimps and shellfish are among the organisms at peril, together with whole ecosystems. The threats to nature are also a great concern for humans, and affect everyone who benefits from nature and the sea – for work, for leisure, and for inspiration.

The NGOs working in the BALSAM project strongly encourage other NGOs and all those concerned about our seas to take action to highlight OA – a phenomenon that is still not well known to everyone. Although the Covid pandemic still affects our lives, we hope to establish creative contacts with fishermen, schools, artists, museums, journalists and the like, to raise awareness of OA – during the Action Week and otherwise.

Materials for dissemination will be made available under the heading “Ocean Acidification Working Group” on [www.airclim.org](http://www.airclim.org).

The BALSAM project is funded by the Swedish Institute.

## Decarbonising the shipping industry

Environmental group Transport and Environment (T&E) has expressed support for the Commission’s initiative to develop a carbon pricing scheme for the maritime sector, as it sends a clear signal to the market that polluters need to pay. Including shipping in the EU emission trading system (ETS) will allow for the internalisation of climate externalities.

Crucially, the maritime ETS will raise revenues that will be essential

for deploying sustainable zero-carbon technologies and fuels in shipping. As global shipping will require between \$70 and 90 billion in annual investments over the next 20 years to fully decarbonise by 2050, a dedicated support scheme for the maritime sector should be set up. A new T&E briefing outlines how this can be done.

Source: T&E News, 5 February 2021.

Link to T&E briefing: <https://www.transportenvironment.org/publications/how-decarbonise-shipping-industry>

# EU air quality policy scrutinised

The forthcoming revision of EU air quality legislation provides an opportunity to strengthen requirements and thus to better protect health and the environment.

In January, the European Parliamentary Research Service (EPRS) published a European implementation assessment (EIA) prepared for the European Parliament's environment committee. The report focuses primarily on the two Ambient Air Quality Directives, but also looks at the implementation of the Industrial Emissions Directive and the EU type-approval legislation for road vehicles. This is timely, as these rules are scheduled for revision in the near future.

The analysis resulted in a number of conclusions and recommendations for policy action, some of which are summarised below.

- As some of the current EU air quality standards are not aligned with the latest scientific knowledge, they need to be brought up to date and there should also be an obligation for a periodic review of the standards against the latest technical and scientific evidence.
- There is a need for EU-level harmonisation of the way air quality data is communicated to the public, and the legal framework must include a provision to guarantee the right of citizens to access justice.
- For some air pollutants, exceedances of the air quality standards are still widespread and persistent, and the periods of exceedance have not been kept as short as possible, despite this being a legal requirement. This non-compliance has led to infringement procedures launched by the Commission against several member states. But the infringement procedures, in addition to being lengthy, do not always succeed in enforcing compliance with the EU air quality standards.
- The air quality plans are critically important for the avoidance, reduction and prevention of air pollution, and action for improvement should focus on the quality of the plans and especially on the measures included. EU-level guidance could support this process, and the implementation of air quality plans needs to be properly monitored



and evaluated, e.g. by introducing an obligation for member states to report to the Commission on the implementation of their plans and to update them when new measures are adopted or when progress is insufficient.

- As regards the Industrial Emissions Directive (IED), national practices for granting derogations to certain installations should not unduly delay implementation of the best available techniques (BATs). The current exclusion from the scope of the IED of some highly polluting installations in the agricultural (livestock) and mining sectors should be reconsidered. Monitoring data should be published in a systematic way to improve transparency and facilitate access to data for the public. The release of many emerging air pollutants should be better monitored and reported. All permits granted under the IED should be made public, which would improve

public access to information and public participation in permit procedures.

The EPRS report also includes a research paper which analyses the local policies designed and implemented by ten cities to reduce air pollution. It also looks at the effects of the first wave of pandemic lockdown measures implemented in the same ten cities (Athens, Barcelona, Berlin, Bucharest, Krakow, Lisbon, Madrid, Paris, Rome and Stockholm).

Christer Ågren

The report "EU policy on air quality – Implementation of selected EU legislation," including an annex "Mapping and assessing local policies on air quality – What air quality policy lessons could be learned from the Covid-19 lockdown?" (January 2021). Available at: [https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS\\_STU\(2021\)654216](https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2021)654216)

# Air pollution and Covid-19

Policies that protect the population from the effects of air pollution are also likely to protect against Covid-19 deaths possibly attributable to air pollution.

**Following a request** from the European Parliament's environment committee, a group of medical scientists led by Bert Brunekreef at Utrecht University have produced a report discussing the potential effects of air pollution on Covid-19. Below is a summary of the recommendations from this expert report:

- The overall impact of air pollution on heart and chronic lung disease is more than large enough to motivate aggressive reduction policies. Current EU limit values for PM<sub>2.5</sub> and NO<sub>2</sub> do not protect public health sufficiently and need to be lowered. Policies that protect the population from the effects of air pollution are also likely to protect against Covid-19 deaths possibly attributable to air pollution.
- Regarding indoor air pollution, no-regret policies such as aggressively discouraging smoking in the home, phasing out woodstoves and improving the ventilation of cooking emissions will likely reduce the burden of respiratory and cardiovascular disease.
- Measures aimed at reducing greenhouse gas emissions often lower emissions of hazardous air pollutants as well, and it is of vital importance to seek and strengthen co-benefits from measures taken in each of these two domains.
- Air pollution causes chronic diseases such as asthma, chronic obstructive pulmonary disease (COPD), lung cancer, heart disease and diabetes. Many of these conditions predispose to Covid-19 hospitalizations, intensive care unit admissions and deaths. For this reason alone, there is serious concern about negative impacts of air pollution on the Covid-19 pandemic.
- Further work is needed, following methods elaborated by WHO and the Global Burden of Disease collaboration, to quantify the burden of Covid-19 attributable to air pollution.
- Many Covid-19 survivors have been burdened by adverse long-term conditions affecting the heart, the lungs and other organ systems. This is of great concern as these conditions can be worsened by air pollution exposure.
- Air pollution and Covid-19 likely affect disadvantaged populations more adversely due to higher exposures and/or increased vulnerability. Therefore, actions to mitigate the adverse effects of both air pollution and Covid-19 should be targeted at disadvantaged groups in particular, where the need is greatest.

Christer Ågren

The report "Air pollution and COVID-19" (January 2021) is available at: [https://www.europarl.europa.eu/RegData/etudes/STUD/2021/658216/IPOL\\_STU\(2021\)658216\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/658216/IPOL_STU(2021)658216_EN.pdf)

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# Estonia: from shale to gale

Rising CO<sub>2</sub> emission quota prices finally seem to have pushed oil shale power off the energy market in Estonia.



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**The last few** years have been very eventful in the Estonian energy sector. The country had long been a net electricity exporter thanks to the oil shale power plants of national energy company Eesti Energia, which until 2018 accounted for 76 percent of total domestic electricity generation with about 1500 MW of installed and usable capacity, amounting to about 70 percent or 11 million tons of the country's total CO<sub>2</sub> emissions. This largely changed in the summer of 2019, when rising CO<sub>2</sub> emission quota prices finally pushed this unique and extremely carbon-intensive fossil fuel largely off the energy market. Following these developments, the government decided in early 2020 to subsidise a new Enefit 282 shale oil plant to intensify ongoing oil production. As the oil is mainly exported, so are the majority of the related emissions from fuel combustion. So the ministers were quick to claim that this decision was still moving Estonia itself towards climate neutrality. In early 2021 the former government fell

due to a corruption scandal and the new coalition has promised to both stop fossil fuel investments and phase out oil shale in all forms. Is this really the case and what are the just alternatives?

The Estonian government has declared two phase-out dates – exiting oil shale electricity by 2035 and shale oil production by 2040 at the latest. Both of these numbers are good, because the oil shale sector and people involved with it urgently needed some clarity about their future prospects. But the numbers are bad, because they are out of touch with reality. As mentioned, electricity generation had mostly stopped back in 2019. The capacity that is still regularly operational is there only because of governmental orders that defy open-market logic. On some colder winter days, when producers in other countries are having outages, more dirty oil shale electricity gets a short competitive chance. The reason for this situation is simple – due to decades-long governmental inaction there simply are

currently no alternatives for quick deployment. As for shale oil, phasing out by 2040 seems widely optimistic, given that this industry is mostly dependent on three factors: world oil price, CO<sub>2</sub> quotas and local environmental taxes. While local taxes have already been lowered to bare minimums by previous governments, the oil price is volatile and the CO<sub>2</sub> price is staying high. However, this in itself would not be a major problem for the oil industry, as it has generously been allocated free emission quotas due to the improbable chance of “carbon leakage”, where Estonian companies would relocate outside the EU (e.g. to neighbouring Russia) to escape the fair climate policies. What is a problem for the industry on the other hand is the fact that these free allocations are decreasing yearly, with the current rate of -2.2 percent proposed to rise to -6 percent or more in the coming years. The industry itself has calculated that this would mean a shutdown of operations no later than 2028. So giving the sector





it seems that some businessmen have decided that perhaps enough time has now passed since the last major nuclear accident in the world that the same technology can be sold again. The difference this time around is the narrative of a “new generation” of nuclear technology, mixing the messages between “3+” and “4th” generation nuclear reactors. These are of course a totally different breed of technologies, but that seems to be the point – gaining public support by promoting the “waste-burning” and very futuristic designs, while preparing to license the problematic older technologies in somewhat smaller forms. The proponents claim that there is no alternative to nuclear, as renewables simply “do not work”, but that these different technologies do not compete with each other. Yet at their conferences every opportunity is taken to blast wind and solar. Actions speak louder than words in this case. The developers also claim that they need no public money for their business venture, yet they have already asked for land near the small town of Kunda on the shore of the Gulf of Finland. While it is highly unlikely that the small modular reactor technology will ever come to realisation, it is still important to keep public funds away from such toxic projects.

While the previous governments had completely missed the obvious end of shale oil electricity, they at least invested in good connectivity with neighbouring countries. The new leaders have the opportunity to turn the failure into a success story by engineering an ambitious transition to renewable energy sources, advocate for overall energy saving, promote energy storage solutions and simplify the creation of energy communities that leave no one behind. A popular local petition is calling for climate neutrality as early as 2035, and the science shows it can be done. So the lights are still on in Estonia, and in the future they could start shining brighter than ever.

Madis Vasser

(Madis Vasser is a policy and advocacy expert at the Estonian Green Movement)

a promise of smooth sailing until 2040 is a risky and possibly very costly bet for the government.

In recent years another important process has been unfolding in Estonia, that of a just transition in the oil shale region. The concept was first introduced by several environmental organisations with the aim of openly discussing the possible alternatives for the people currently employed in the shale sector. The multi-stakeholder roundtables were held in Ida-Virumaa, the north-eastern part of the country most affected by oil shale phaseout. Topics discussed ranged from mapping the various problems and obstacles that have previously prevented such transitions from finding alternatives and ways to fund them. As of 2021 the work has led to local-level platforms and governmental steering groups that are compiling the territorial just transition plan needed to apply for EU funds to help the region in moving towards a more diversified and low-carbon economy. At

the end of 2020 a group of experts held some intensive co-creation sessions to input their ideas for a “Green Plan” for the region. Some potential projects included a green-tech innovation centre, a residential sustainability showcase area, solar and wind co-operatives, innovative district heating and an overall new narrative for the country among other initiatives. Moving from “shale to gale” is of course not an overnight possibility and many related problems must first be solved, starting with developing the electricity grid and ending with installing new defence radar systems to free up more land for the wind parks. But overall, the problem of the transition is not technical, but purely political.

Yet there is another recent development that can hinder Estonia’s progress on renewable energy. This is the false promise of small modular nuclear reactors, being forefully advertised by a small local company. While such tiny nuclear power plants have been proposed for decades,



# Net zero air travel? Climate-positive hamburgers?

Carbon offsetting under the CDM produces extraordinary claims. Don't believe them, says the Swedish broadsheet Dagens Nyheter.

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**The Clean Development Mechanism,** CDM was one of the flexible mechanisms defined in the Kyoto Protocol that provides for emission reduction projects which generate Certified Emission Reduction (CER) units that may be traded in emission trading schemes.

The CDM was criticised by NGOs as soon as it was introduced, mainly by the US, which by the time of Kyoto Protocol (1997) had no intention to cut its coal, gas and oil, under president Bill Clinton.

The Americans got all the flexibility they wanted. Then they defected from the Protocol anyway.

When the Obama administration re-entered the Kyoto Protocol and promised to cut emissions, at least in the long term, the flexible mechanisms were well established, with entrenched interests in defending them, both among sellers in the third world and among buyers and middlemen in rich countries.

By 2018 they had generated projects worth more than \$300 billion.

This continued even as the price crashed to zero in 2012. The price remains low at about €0.3/ton, compared with about €25/ton for EU trade.

To judge from a series of articles<sup>1</sup> in the most influential Swedish daily newspaper, Dagens Nyheter (DN), in late 2019, the early criticism of the CDM was well-founded.

Afforestation is one of the most commonly used ways to generate carbon reduction units (CERs). Credits to save rainforests that keep sucking up CO<sub>2</sub> were to be sold to companies as offsets against emissions of greenhouse gases.

“Carbon offsets are not our get-out-of-jail free card,” the UN body wrote<sup>2</sup>.

“45 per cent of forest restoration projects have instead become plantations for fast-growing monocultures that decreases diversity

and store less carbon,” commented Dagens Nyheter with reference to a Nature article<sup>3</sup>.

Rainforests that are supposedly being saved by such projects keep getting destroyed in Brazil, the country with most such projects. This was reported by Propublica<sup>4</sup>, and led, according to Dagens Nyheter to the UN distancing itself from its own system:

The Swedish hamburger chain Max Burger claims to be climate positive, “every chew contributes to a better climate,” they say. This is because they have offset 110 per cent of their emissions, and they plant domestic trees in Uganda. They won a UN prize in September 2019.

But as Dagens Nyheter writes, even “this prestige project is scattered with question marks”, referring to researchers who have interviewed villagers:

- Some have logged before due time.
- The contracts are in English, which few villagers speak.
- Project developer Ecotrust is described as inaccessible.
- The long-term climate benefit is uncertain. Farmers undertake to leave the trees for 25 years, but are only paid for 10 years. There is no plan for replanting after logging. At present, growing coffee or sugarcane is more profitable.

Afforestation is not always beneficial for the climate, according to scientist Mariska te Beest. Savannas that are kept open by grazing animals already store large amounts of carbon in the soil, and if you plant forest on such ground, the soil will probably store less carbon, although more research is needed. And if the forest is darker than the land before afforestation, this will have a heating effect outside the carbon balance.

Max Burger are well aware that offsets must be combined with emission reduc-

tions. And their accounting is transparent, according to DN.

This is unusual. Sweden's biggest travel company, Tui, claimed that it compensates for all its emissions, and in advertisement videos that it “contributes to a better world”. It gave no details about its offsets to DN, but it considered CDM as a certificate of quality from the UN. The CDM credits are registered by the EU transaction log, but are not public until three years later.

“None of the companies Tui, Ving (the second biggest travel company in Sweden), SAS (airline), or Bra (airline) will say how much money they invest in climate compensation. While the companies include offsets in the ticket price, they claim that it does not result in any price increase for the customer.”

Buyers of offsets, for example airlines and travel agencies, depend on companies that specialise in offsets, as they usually do not have the know-how inhouse. That does not contribute to transparency.

“Of those [companies] that have been contracted by or referred to by airlines and travel companies, four are based outside Sweden, and others have foreign owners, holding companies in Switzerland, Singapore or Cyprus. They all say they are prohibited from disclosing information about their clients,” writes DN.

Dagens Nyheter concludes that it is not possible to verify the claims of Tui or the airline SAS that they offset all their emissions. They will not show any receipts or certificates. Ving and Bra make claims that are partly verifiable.

Even if a company is open about how many offsets it has purchased, where they take place, gives access to its contracts, and can prove that these offsets cover direct and indirect emissions, that is still only half the story.

Whereas there is no double-counting in emission trading within the EU, for example, this is not certain for the CDM. A wind energy project that offsets an investment in a coal power plant will reduce emissions by so many tonnes per year over say 25 years. Under that condition it is easy to agree on how much. But how do you know that a) the coal power plant would have been built without the CDM project and b) that the wind farm would not have been built without the CDM project?

If the answer is no to either question, the project does not deliver any emission reduction. The purchaser has paid for a reduction, but there is no “additionality”.

The Öko Institute in Freiburg, Germany, and Stockholm Environment Institute have tried to answer the question of whether a project is likely to be additional or not, and have screened 76 per cent of all CDM projects between 2013 and 2020, in a study: “How additional is the clean development mechanism?” The scientists conclusion is that 85 per cent of the projects in the study have low probability of yielding additional emission reductions without over-estimates.

Only 2 per cent have a high probability of giving the emissions reductions at face value, and 13 per cent somewhere in between.

Martin Cames, one of the seven researchers behind the study said to DN:

“Renewable energy projects, and especially wind parks, have two great challenges. They are very expensive investments and

the income from CDM are tiny, compared to factors such as interest rates, electricity prices and other things that decide the financial viability. You also have to assess how much renewable energy is already part of the national policy.

There are a good many wind power plants in India that have been built without CDM money, writes DN, referring to a study from 2014 from LSE and Paris Tech.

It is not just CDM projects that produce dubious and overestimated emissions reductions.

“According to the SEI and ÖI researchers, writes DN, the conclusions are also valid for certifications on the voluntary market. The Gold Standard and Verified Carbon Standard are often described as stricter than the CDM, but according to the report they share the same problems of additionality and over-rating of carbon credits. The same applies to the air industry’s international programme CORSIA, which comes into force in 2021, and is expected to dominate the demand for offsets in the future.

Another problem, pointed out by DN with reference to another SEI study, is that old projects, where emission reductions took place many years ago, are now being used to meet climate targets under the Paris agreement<sup>5</sup>, CORSIA and travel company Ving among them.

Sweden is a key player in offsets, as the fourth biggest purchaser of CDM.

DN confronted the climate minister Isa-

bella Lövin (Green Party) after the series of articles. She has previously compared offsets to indulgence and now said that “we have to get away from the thought that you can offset anything”.

She has nevertheless defended the Swedish Energy Authority and its vast, long-term purchase of CDM projects, but also points out that the credits so far have been annulled and not used to fulfill climate targets.

On the other hand, Ulf Kristersson, leader of the biggest opposition party to the right of the centre-left government, said to DN that Lövin’s attitude on climate policy is “very provincial, almost nationalistic”, and that “it is not wrong to use Swedish resources to make efforts in other places where it is more efficient than to make them in Sweden”.

Fredrik Lundberg

1. [www.dn.se/om/dn-granskar-klimatkompensation/](http://www.dn.se/om/dn-granskar-klimatkompensation/) (in Swedish), by Sverker Lenas and Lisa Röstlund
2. [www.unenvironment.org/news-and-stories/story/carbon-offsets-are-not-our-get-out-jail-free-card](http://www.unenvironment.org/news-and-stories/story/carbon-offsets-are-not-our-get-out-jail-free-card)
3. [www.nature.com/articles/d41586-019-01026-8](http://www.nature.com/articles/d41586-019-01026-8)
4. <https://features.propublica.org/brazil-carbon-offsets/inconvenient-truth-carbon-credits-dont-work-deforestation-redd-acre-cambodia/>
5. <https://www.sei.org/publications/clean-development-mechanism-nationally-determined-contributions-aviation/>

### Rules of the Paris Agreement:

The French government has published a small briefing about the rules of the UNFCCC Paris Agreement<sup>1</sup>. At COP 26 in November 2021 the UNFCCC plans to decide on the rules of Article 6 in the Paris Agreement, which includes the prolongation of Clean Development Mechanism (CDM) type activities. A new report published last November<sup>2</sup> updates the numbers on the quantity of CDM credits that could be transitioned to post-2020 if no restrictions are adopted under Article 6. The transition of emission rights issued under the CDM for use by Parties towards their NDCs is a key outstanding issue for Article 6 negotiations at the UNFCCC. To inform the ongoing negotiations, the report set out estimates of the potential emission rights supply by two groups of modelling teams, from research institutes in Japan and Germany. The report presents an updated analysis of the potential supply of emission rights issued for emission reductions occurring in the second commitment period of the Kyoto Protocol

between 1 January 2013 and 31 December 2020 based on a selection of possible restrictions for their transition. The analysis indicates that the supply potential for emission rights for emission reductions in or after 2013, in the absence of any restrictions, is in excess of 4 billion. Environmental NGOs are very concerned that governments will agree on weak rules at COP 26 and allow a continuation of false climate solutions, as described in the attached article. Environmental NGOs in Sweden are against the use of such flexible mechanisms for the NDCs from Sweden and the EU.

Compiled by Reinhold Pape

1. <https://www.tresor.economie.gouv.fr/Articles/ed92a1e7-6eb5-4518-8ac3-a54f1fe2a5fb/files/aecc8cc8-7bd5-4ef8-b25a-4fd87ac991f1>
2. <https://newclimate.org/2020/11/25/cdm-supply-potential-for-emission-reductions-up-to-the-end-of-2020/>

# Towards sustainability of marine governance

EU member states are currently developing Marine Spatial Plans, a key tool to improve cross-sector cooperation and minimise spatial conflicts. Multiple useful reports provide best-practice examples and policy recommendations.

**The oceans are** shared by a myriad of different stakeholders, and the growth of the offshore renewable energy sector brings increased potential for conflict. Marine Spatial Plans (MSPs) should enable simultaneous harnessing of the energy of the wind and seas but also protect our marine environment from overexploitation. In addition, the seas should continue to be able to provide healthy nourishment and sustainable livelihoods to coastal communities and beyond.

MSPs can provide countries with guidance and frameworks to learn from in order to better plan the management of our marine environment, strengthening community involvement in the process, and facilitate constructive stakeholder dialogues. In Europe, this process is vital to reach the aim of the European Green Deal to live sustainably within the planetary boundaries. For example, MSPs should support both the protection of 30 percent of our seas over the next ten years, as outlined in the 2030 EU Biodiversity Strategy, as well as increasing EU offshore wind capacity to 30 times current levels by 2050, as outlined in the Offshore Renewable Energy Strategy. To fulfil the requirements of the EU Maritime Spatial Planning Directive member states are required to prepare and adapt spatial plans for territorial waters and Exclusive

Economic Zones by March this year.

The European Commission acknowledges the conflict challenge between different sectors. “Our Green Deal cannot be successful without public support,” said Commissioner Kadri Simson when prompted by a French journalist who enquired about local resistance to offshore wind projects. According to Simson, engaging with the local population is of paramount importance for national authorities in order to “move from public acceptance to public support” when it comes to offshore wind deployment.

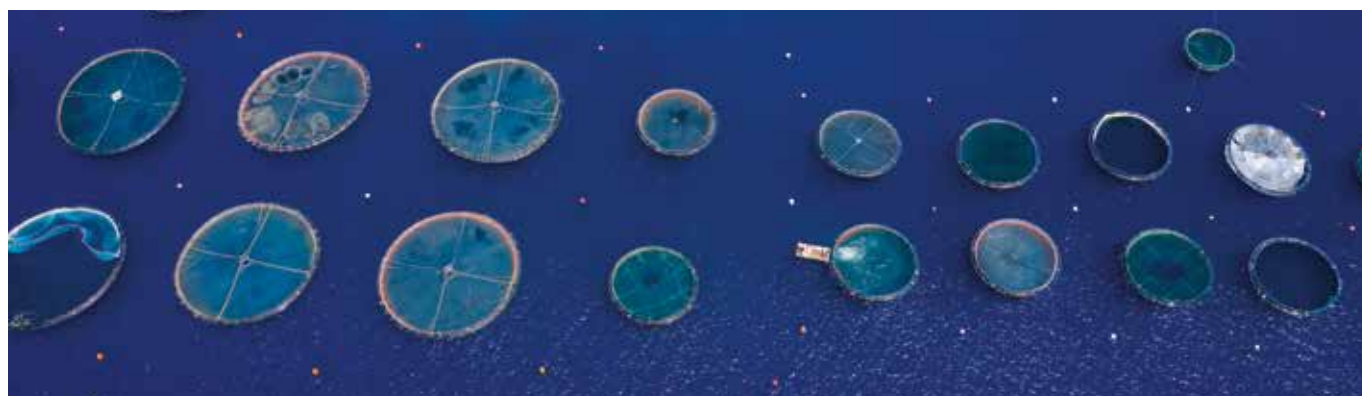
The Greens in the European Parliament have published a new report on best practice in maritime spatial planning. The report reviews present practice in MSP in the EU and beyond. It identifies best and good practice for MSP models that can be pursued as opportunities to showcase co-operation between stakeholders, where the outcome is mutually beneficial to fisheries, renewable energy production, and marine protection.

The report distinguishes between two interpretations of the role of MSPs. The primary task of MSPs can be described as sea-use regulation. This entails the regulation of activities in marine space through zoning and designation of usage. This approach is the most common one.

MSPs may also perform a strategic visionary role and establish a coherent policy framework for future decision-making. Strategic vision statements are essential to achieve the cross-sectoral, integrated ambitions of MSPs. This approach can support the identification of potential synergies across policy sectors. Both interpretations of MSPs are important to their role in conflict management.

In addition to these approaches another focus has emerged with the communicative shift in planning practice that brings a view of planning as a transdisciplinary process. A communicative approach has highlighted that spatial planning has the potential to enable “transformative practices”. MSPs should also be concerned with “place-making” at sea – shaping how sea spaces develop through future-oriented transformative spatial strategies. In this way, MSPs can act as a catalyst for change rather than merely a regulatory function.

Another study commissioned by the PECH Committee of the European Parliament focuses on the impact of the use of offshore wind on fisheries. Mitigation measures have been identified to reduce conflict potential and should be picked up in an MSP process, for instance in the strategic environmental assessment (SEA). These comprised 1) early stakeholder



consultation to detect conflict potential at an early stage and acknowledge the importance of all actors; 2) facilitation of negotiation processes by independent third parties and the creation of guidelines for the expansion of offshore renewables; 3) compensation payments for the disturbance and the associated loss of income or additional expenditures. All three measures aim to contribute to a reduction in impact. Co-design approaches for the co-location of offshore renewables with other uses can reduce the impact potential on fisheries, strengthen relationships with sectors of concern, and even enable beneficial co-operation between them.

Denmark is one of the examples of best-practice for co-existence between fisheries and offshore wind farms which is included in the study by PECH. The Danish Energy Agency (DEA) surveyed possible sites in the North Sea and Baltic Sea for an 18 GW offshore wind farm. The Danish Fisheries Act foresees a consultancy process in which developers present and discuss their development plans directly to the fishing industry.

Negotiations include potential mitigation measures as well as compensation for financial disruption or displacement, due to the wind farm itself or the export cable corridor. Among possible mitigation measures are the inclusion of fishermen in the construction and operation of the wind farm, or permitting passive fisheries within the site. Negotiations on compensation are carried out by the Danish Fishermen's Association and verified by an independent consultant. The amount of the compensation payment depends on the analysed impact on fisheries.

The project Baltic Energy Areas – A Planning Perspective (BEA-APP) highlights the lessons learned regarding stakeholder involvement. Important recommendations to add to those mentioned above include interactive communication methods that are suitable in the process of stakeholder involvement to promote cooperation in planning and implementation of renewable energy projects. Stakeholder involvement should give confidence to all participating parties that their contribution to the spatial planning and development of renewable

energy projects is not a waste of time and that individual opinions are considered.

Vertical stakeholder integration increases robustness of multilevel governance structures, especially in areas with overlapping responsibilities. Sustainable MSPs need to be based on a robust bottom-up framework of multilevel governance. Studies have shown that learning and capacity building at multiple governance levels through transboundary initiatives works as an enabler for conflict solutions.

Emilia Samuelsson

Sources:

O'Sullivan (2021). Best Practice in Maritime Spatial Planning: Towards Mutually Beneficial Outcomes for Fishers, Renewable Energy Production and Marine Conservation. On behalf of the Greens in the European Parliament

Stelzenmüller et al. (2020). Impact of the use of offshore wind and other marine renewables on European fisheries. Research for the PECH committee.

Bremere et al. (2018). Stakeholder involvement plans: Transnational lessons learned report on stakeholder involvement. Baltic Energy Areas – A Planning Perspective. Baltic Environmental Forum – Latvia.

## Climate crimes must be brought to justice

In December 2019, at the International Criminal Court in the Hague, Vanuatu's ambassador to the European Union made a radical suggestion: make the destruction of the environment a crime. Catriona McKinnon, Professor of Political Theory at the University of Exeter, United Kingdom, has proposed that "international criminal law should be expanded to include a new criminal offence", which she calls postericide. "It is committed by intentional or reckless conduct fit to bring about the extinction of humanity. Postericide is committed when humanity is put at risk of extinction by conduct performed either with the intention of making humanity go extinct, or with the knowledge that the conduct is fit to have this effect. When a person knows that their conduct will impose an impermissible risk on another and acts anyway, they are reckless. It is in the domain of reckless conduct, making

climate change worse, that we should look for postericial conduct." ENDS reports that "efforts to criminalise serious environmental harm have taken a leap forward as three European countries signalled they would discuss the idea at a political level".

Over the past few months, the governments of France, Sweden and Belgium have all announced they would seriously consider supporting attempts to criminalise "ecocide".

In June 2020, French president Emmanuel Macron said he would examine how the principle of ecocide could be incorporated into French law after nearly all participants in the country's citizen's assembly on climate recommended it should be criminalised nationally.

In autumn 2020 the Belgian government followed suit, saying it would consider recognising a crime of ecocide in domestic and international law, and the Swedish parliament announced that it would discuss criminalising ecocide.

Sweden's Olof Palme was the first

head of state to refer to mass destruction of nature as "ecocide", at the 1972 UN Conference on the Environment in Stockholm, and to declare that it "requires urgent international attention".

Compiled by Reinhold Pape

Sources:

<https://en.unesco.org/courier/2019-3/climate-crimes-must-be-brought-justice>

<https://www.bbc.com/future/article/20201105-what-is-ecocide>

ENDS, Isabella Kaminski, 06 Nov 2020, news@endseurope.com

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## Our food system is the main driver of biodiversity loss

The world's food production is destroying natural habitats and occupies approximately 50 percent of the habitable land. The main reason for the rapid land expansion is animal farming. Farmed animals (mainly cows and pigs) now account for 60% of all mammals by weight, with humans making up 36% and wild mammals just 4%. Agriculture has been identified as a threat to 24,000 out of the 28,000 species on the endangered "Red List".

The Chatham House thinktank's new report explores ways of transforming the destructive agricultural system. The main issue according to the study is the production of cheap food, as prices are pressed lower through actions such as clearing natural land and using harmful fertilisers and pesticides.

The UN-backed report presents three main solutions. First is a shift to plant-based diets as livestock have the largest environmental impact. More than 80 percent of global farmland is used to raise animals, which provide only 18 percent of calories eaten. That shift gives access to land that can be used for the second solution; restoring ecosystems to increase biodiversity. The third solution is farming in a less intense and damaging way but accepting lower yields. Thus, the availability of land underpins this solution too, as organic yields are on average about 75% of those of conventional intensive farming.

Source:

Benton, T., Bieg, C., Harwatt, H., Pudasaini, R., & Wellesley, L. (2021). Food system impacts on biodiversity loss.

## Slow progress on proposal to modernise Energy Charter Treaty

The modernisation of the Energy Charter Treaty (ECT) has faced mounting criticism. Spain and France have been pushing for the EU to leave the treaty. The treaty, a multilateral investment agreement protecting foreign investments in energy supply, can be used

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to protect fossil fuel projects. It allows energy companies to challenge governments on measures that could impact the expected income from investments made. It currently has 54 signatories, including the EU and nearly all European countries, as well as Turkey, Central Asia and Japan.

The ECT is currently under review, but progress has been slow on the modernisation process and campaigners claim it will not solve core issues such as arbitration or the protection of fossil fuel investments, as any reform needs unanimous approval from the treaty's 54 signatories.

The treaty's Investor-State Dispute Settlement (ISDS) could lead to taxpayers paying up to €1.3 trillion in arbitrations by 2050, of which 42 percent would be paid by EU citizens. For example, in February the German energy giant RWE used the ECT to claim €1.4 billion in compensation from the Netherlands over its planned phase-out of coal from the country's electricity mix by 2030.

However, leaving the treaty does not end the commitment, as a sunset clause means that countries must uphold their commitments for another 20 years. Italy, for example, left in 2016 and faced a number of post-withdrawal arbitrations.

Source:

Taylor, Kira (2021) EU pushes for fossil fuel phase-out in "last chance" energy charter treaty talks. Accessed 19 February 2021. <https://www.euractiv.com/section/energy/news/eu-pushes-for-fossil-fuel-phase-out-in-last-chance-energy-charter-treaty-talks/>

## Solar radiative management opposed

During 2021, US initiatives are again planning to run experiments to manipulate the Earth's atmosphere. One such experiment is scheduled to take place at an aerospace centre in Kiruna in northern Sweden in June 2021, but is strongly opposed by environmental NGOs<sup>1</sup>.

Climate Action Network (comprising 1500 NGOs/networks worldwide) has declared a clear position<sup>2</sup> against solar radiation modifications (SRM), summarised as follows:

1. Robust adaptation and mitigation actions are the first-line solutions to climate change. SRM is not a substitute for either and should not be seen as climate action.
2. Recognise the inherent transboundary nature of SRM and significant and unknown risks (geopolitical, social, environmental, ethical) involved.
3. Strongly opposes deployment of SRM.
4. Strongly opposes real-world experiments.

Reinhold Pape

1. <https://www.theguardian.com/environment/2021/feb/08/solar-geoengineering-test-flight-plan-under-fire-over-environmental-concerns-aoe>

2. [https://climatenetwork.org/wp-content/uploads/2020/11/can\\_position\\_solar\\_radiation\\_management\\_srm\\_september\\_2019-1.pdf](https://climatenetwork.org/wp-content/uploads/2020/11/can_position_solar_radiation_management_srm_september_2019-1.pdf)

# Analysing marine geoengineering technologies

AirClim has published a briefing about how geoengineering schemes would negatively affect the oceans. None of the methods are new or have been tested on any meaningful scale.

**Marine cloud brightening:** Finely ground sea salt is sprayed up from tall chimneys on ships, manned or unmanned. The most common proposal for achieving such a goal is to inject naturally occurring sea salt into cloud updraughts.

**Microbubbles/sea foam:** The water in the wake of ships is brighter because of small bubbles. The proposed scheme is to reinforce this effect by adding surfactants such as those used to remediate oil spills and, in lower concentrations, as a widespread pollutant in run-offs from the use of detergents, soap and toothpaste etc. The bubbles would reflect more solar energy back into space, and thus have a cooling effect.

**Ocean fertilisation:** Some parts of the oceans have low levels of micronutrients, one of which is iron. If relatively small amounts of iron are added there, it will cause an algal bloom. If a substantial part of the algae (or plankton that eat the algae) sink to the sea floor, this will draw carbon from the air and more or less permanently store it on the sea floor.

**Upwelling:** Cold, deep water that is rich in nutrients can be forced up to the warmer surface by pumping or natural winds. As in ocean fertilisation (above), this would enhance algal growth and fix CO<sub>2</sub>.

The critical analysis of marine geoengineering technologies can be found here:

Compiled by Reinhold Pape

The extended analysis of marine geoengineering technologies can be found here: <https://airclim.org/publications/analysing-marine-geoengineering-technologies>



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## CAN conclusions on CCS

Climate Action Network (comprising around 1500 NGOs/networks worldwide) has published a new 21-page position paper on carbon capture and storage with 100 scientific references. Based on current global trends and an analysis of existing literature and reports, CAN draws the following conclusions on CCS and its potential to serve as a climate-mitigation tool:

1. CCS at scale remains largely unproven and its potential to deliver significant emission reductions by mid-century is currently limited.
2. Safe, permanent, and verifiable storage of CO<sub>2</sub> is difficult to guarantee.
3. The climate impact of CCS should consider all emissions and costs from concomitant processes.
4. CCS is not needed in the power sector. Faster, cleaner, safer, more efficient, and cheaper means exist to reduce CO<sub>2</sub> emissions, such as phasing out fossil fuels and replacing them with renewable energy, energy efficiency, and energy conservation.
5. Enhanced oil and gas recovery is dangerously at odds with any climate action and will not lower emissions in comparison to renewable energy and energy efficiency. To meet the Paris Agreement target, the majority of fossil fuel reserves must be left in the ground.
6. A suite of strategies and technologies already exist to cut emissions in the industrial sector, without CCS. Emissions in the industrial sector can be significantly reduced by increasing process efficiency,

but there is also a need to increase the speed of development and/or deployment of low- or zero-carbon processes and materials, replacing fossil fuels with renewable energy, increasing recycling rates, and designing alternative materials with lower emission footprints than steel, conventional cements, plastics and aluminium. CAN strongly supports further and internationally coordinated research, development and deployment for CO<sub>2</sub>-free processes and alternative materials to ensure that energy-intensive industries eliminate all emissions by mid-century at the latest.

Reinhold Pape

The position paper can be found here:

[https://climatenetwork.org/wp-content/uploads/2021/01/can\\_position\\_carbon\\_capture\\_storage\\_and\\_utilisation\\_january\\_2021.pdf](https://climatenetwork.org/wp-content/uploads/2021/01/can_position_carbon_capture_storage_and_utilisation_january_2021.pdf)



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# Phasing out fossil gas power stations in Europe by 2030

Presenting a list of gas-fired power stations in the EU and the UK that should be closed within the next 10 years.

**Fossil gas has** to be phased out if Europe is to comply with the Paris agreement. A phase-out strategy must include heating, industry and power. This is clearly possible, though the fossil gas lobby is strong and resourceful. As a first step in the fossil gas phase-out in the EU this analysis presents a list of the 70 largest fossil gas power station polluters, to be closed down over the next ten years.

Coal use peaked globally in 2013 and in Europe in 1985. Oil peaked in 2005 in the EU and may have peaked globally in 2018. Global gas use, on the other hand, has grown relentlessly at least through 2019, globally, and has remained roughly flat in Europe over the last 20 years.

In 2019 the EU-28 used 16.9 exajoules of natural gas, which resulted in direct emissions of some 950 million tonnes of CO<sub>2</sub>, or about 28 percent of CO<sub>2</sub> emissions.

Natural gas use leads to emission of other greenhouse gases. Upstream, methane and CO<sub>2</sub> are emitted. Combustion of gas emits N<sub>2</sub>O from denitrification and/or NO<sub>x</sub> and ammonia, some of which later turns up as N<sub>2</sub>O. More CO<sub>2</sub> emissions result from energy use for compressors in gas pipelines and for liquefaction to LNG and propulsion of LNG ships.

Europe cannot get anywhere near its climate targets without a steep reduction in natural gas use.

The crucial point is not the year in which net zero is achieved, but minimising emissions on the way. Gas use in Europe emits at least a billion tons of CO<sub>2</sub>-eq/year, of which some 20–25 per cent is power, so left unchanged by 2050 that would amount to 30 billion tonnes, which cannot be shoehorned into any kind of compliance with Paris goals.

Continued gas use with carbon capture and storage is not an option. There is not one gas power plant or gas heat plant with CCS in operation on any relevant scale anywhere in the world. There is a reason for this. It costs too much to capture, transport and store a ton of CO<sub>2</sub> from gas power – far beyond any conceivable price in the ETS.

Gas power plants are different both in design and how they are operated. Other things being equal, older plants with lower efficiency emit more CO<sub>2</sub>. Plants that have been converted from coal or oil power are less efficient and emit more CO<sub>2</sub> per kWh of electricity. Power-only plants emit more than combined heat and power plants.

The biggest difference, though, is how much they are operated. A “base-load” plant that is used all the time, 8760 hours

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per year, at full capacity, emits 100 times as much as a “peaker” plant that is only used on average 87 hours per year. Most gas power plants cannot easily be put in either category. They operate opportunistically depending on gas price, electricity price and carbon price, so the emissions can differ considerably from year to year.

This makes it difficult to say which plants are the worst from a climate perspective. CO<sub>2</sub> data can, with a lot of work and a bit of luck, be found for any one plant for one year. But the figures vary and do not tell much how much it is supposed to emit in the coming years.

This calls for a two-thronged approach.

Higher CO<sub>2</sub> prices, which we have already seen, will have many beneficial effects. The least-efficient plants will be hardest hit, and coal and lignite will be hit still harder. As more coal power is killed, gas power will be on the front line. If high CO<sub>2</sub> prices are sustained and continue to rise this will, in theory, take care of the prioritisation.

But it would be dangerous to rely only on the emission trading system to deliver the necessary cuts. We must not forget that the ETS was next to useless between 2005 and 2017, and that the EU institutions do not exercise hands-on control over the price, nor that they watered down the 2030 emissions target from -65 to less than -55

per cent. The EU has also a large swathe of other legislation that sometimes reinforces, but sometimes contradicts climate targets.

On top of that, member states have a lot of influence over the fate of the individual power plant, which can be used to enhance or weaken EU climate policy.

The one thing we know for sure is that when a power station is decommissioned and torch-cut into pieces, it will not emit any more CO<sub>2</sub>. As long as it is still operative, even if it is not much used, or even mothballed, there is always a risk that market conditions or policy will restore it to full operation.

An accurate and detailed analysis of which plants to shutter first should also consider the short-term consequences for each plant in each member state. It is for example not a good idea to shutter a gas power plant in order to save lignite power plants, as happens right now in Germany. It is impractical to ask for closure of a plant that is essential for grid stability, or to re-ignite debate about nuclear power in countries that have decided to shut down some or all reactors.

Grid stability issues are complex, but they cannot legitimise the operation of gas power plants until 2050; they should be solved within two to three years. The phasing out of coal has largely already

happened in the UK and France, Portugal and Spain, so it is no longer a pretext for keeping gas. Nuclear will be gone from Germany by the end of 2022 and then it will be off the table. Phasing in new wind and solar does not take decades, more likely two or three years, and it is already happening. New power lines have long lead times, but a lot of construction is already going on. Some demand-side management and energy efficiency can be fast and cheap, but is often held back by legal and other barriers.

So while there is no one way to tell which plants to phase out first, a simple proxy is capacity. That is also where we have data. The first priority is to stop planning for new gas power plants, and stop building them. Then, other things equal, shut the biggest ones first, as they are either the biggest emitters or have the potential to be so.

Fredrik Lundberg

The extended analysis by Fredrik Lundberg about fossil gas phase-out and the 70 largest fossil gas power stations in the EU and UK is published by AirClim in a briefing: <https://airclim.org/publications/phasing-out-fossil-gas-power-stations-europe-2030>

**Box: 10 largest gas-fired power stations in the EU and UK**

Name	Company	Status	country	MW
Peterhead power station 1	SSE plc	operating	United Kingdom	1180
Spalding power station 1	Intergen NV	operating	United Kingdom	950
Car-rington power station 1 & 2	Electricity Supply Board (ESB)	operating	United Kingdom	910
Langage power station	EP UK Investments Ltd.	operating	United Kingdom	905
Montalto Di Castro power station 1	Enel	operating	Italy	900
Montalto Di Castro power station 2	Enel	operating	Italy	900
Montalto Di Castro power station 3	Enel	operating	Italy	900
Montalto Di Castro power station 4	Enel	operating	Italy	900
Emsland power station D	RWE Generation SE	operating	Germany	887
Simeri Crichi power station	Edison SpA	operating	Italy	885

## NGO campaign: Clean the Industry

Industrial emissions take a heavy toll on our health, environment and climate, yet current EU laws fail to keep them sufficiently under control. A new petition demands that the EU step up protection. The “Clean the Industry” campaign was launched on 1 February 2021 by a coalition of legal, environmental and health experts, and urges the European Commission to strengthen the Industrial Emissions Directive (IED), which determines emission ceilings for over 50,000 industrial facilities across the EU, and to put a lid on toxic and climate-wrecking emissions.

Linked to a public consultation on updating the IED, campaigners call on policymakers to make it fit for the climate fight and a non-toxic environment, and

invite citizens to sign the petition and make their voices heard.

“The whole point of the IED is to protect us and our environment from the negative impacts of industrial activities. If the Commission is serious about their zero pollution, circular economy and carbon neutrality goals, they must redesign its scope, rethink how standards are set, and ensure greater transparency,” said Christian Schaible at EEB.

Source: EEB META, 4 February 2021. Link to the campaign: <https://www.cleanteindustry.eu>

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# Decarbonise buildings through energy efficiency not hydrogen

In an open letter to the EU Commission a coalition of businesses and civil society groups has urged that renewables and energy efficiency should be prioritised over hydrogen to decarbonise buildings.

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**For the European Union** to achieve a higher 2030 EU climate target, massive emission reductions are required in the building sector, specifically a decrease of 60 percent compared to 2015. The Renovation Wave strategy includes the application of the energy-efficiency-first principle in synergy with increased renewables integration. In the coming years there are plans to renovate 35 million homes and public buildings, making them more energy efficient to reduce their massive carbon footprint.

While the European Commission puts the building renovation wave high on its agenda, many countries have been procrastinating on building renovation programmes. The Commission aims for a 32.5% improvement in energy efficiency by 2030. A review of EU member states' national energy and climate plans shows that there is a gap of 2.8 percentage points for primary energy consumption and 3.1 percentage points for final energy consumption. "You would require at least a doubling, if not a tripling of member states' efforts, to increase energy savings and close the gap", said Stefan Scheuer, secretary general of the Coalition for Energy Savings.

Hydrogen has often been looked at as a

solution to support the decarbonisation of the sector. Pilot projects in which hydrogen is injected into an existing gas network already exist and are on the rise. In the United Kingdom, buildings in the village of Winlaton will be some of the first in the UK to trial natural gas blended with hydrogen. About 670 houses and several businesses will receive the hydrogen blend for about 10 months, starting this year. The main reason to blend hydrogen with gas is that it doesn't require changing existing gas distribution networks or heating systems, making decarbonisation cheaper.

In an open letter to the EU Commission, a coalition of 33 businesses and civil society organisations and think tanks highlights the risk that this is a distraction from longer-term solutions that are available now. The letter states that "to optimise the process of heat decarbonisation, energy efficiency options must be favoured because they can immediately deliver real carbon savings, while accommodating a growing share of renewable sources".

One event that illustrated the risk of distraction was the IRENA Innovation Week, which focused on the topic of strategies of decarbonising end-use sec-

tors. A conclusion was that there remains a collective lack of a shared vision of the trajectory sectors should follow, and a lack of planning for how to do so. Over 100 expert speakers participated from over 35 countries. The discussions demonstrated that the objective of decarbonisation is clear, but what is less clear is the strategy to achieve this. All parts of the energy system are in flux, with changes happening simultaneously on the supply and demand sides. Changes on so many fronts make it difficult to chart a clear pathway, while increasing the risk of stranded assets.

The open letter urges EU executives "not to overestimate the zero-emission gas potentials, mostly imported from abroad, because it would constrain EU consumers to fund unnecessary infrastructures, such as gas pipelines (or their upgrade) and would divert precious financial resources away from immediately applicable heat decarbonisation solutions".

Monica Frassoni, President of the European Alliance to Save Energy (EU-ASE) has stated: "To achieve higher emission reductions by 2030, the EU must act fast to decarbonise buildings as one of the most energy consuming and polluting sectors. To make this happen, we need to prioritise energy efficiency and renewables, while using hydrogen to decarbonise harder-to-abate sectors, like chemicals and steel."

Emilia Samuelsson

Source:

Open Letter Decarbonising the EU building stock with available solutions and no direct use of hydrogen

Link: [https://euase.net/wp-content/uploads/2021/01/210120\\_Open-letter\\_Timmermans\\_hydrogen.pdf](https://euase.net/wp-content/uploads/2021/01/210120_Open-letter_Timmermans_hydrogen.pdf)

Latest accessed 13th of February 2021

## Fossil fuel air pollution caused 8.7m deaths globally

An estimated one in five deaths each year can be attributed to air pollution from fossil fuel burning, a figure much higher than previously thought, according to new research led by Harvard University and published in the journal *Environment Research*.

The study “Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem” shows that more 8.7 million people around the globe die each year as a result of breathing in fine particle (PM) pollution from the burning of fossil fuels. Regions with the highest concentrations of fossil-fuel-related air pollution, including eastern North America, Europe, and South-East Asia, have the highest rates of mortality.

“Our study adds to the mounting evidence that air pollution from ongoing dependence on fossil fuels is detrimental to global health. We can’t in good conscience continue to rely on fossil fuels, when we know that there are such severe effects on health and viable, cleaner alternatives,” said co-author Eloise Marais at UCL.

Source: UCL News, 9 February 2021. Link: <https://www.ucl.ac.uk/news/2021/feb/fossil-fuel-air-pollution-responsible-1-5-deaths-worldwide>

## Clean Air Day 2021

Charity Global Action Plan has announced that this year’s Clean Air Day will take place on 17 June. The aim is to provide the public with resources that will enable businesses, schools, parents and local authorities to take action to reduce air pollution.

“While face-to-face events will continue to be restricted this year, we hope people and organisations still make efforts to leave the car at home, hold knowledge-sharing online events, share information and inspiration on social media and ensure that the demand for clean air is heard across the media to protect our children,” said Larissa Lockwood, director of Clean Air at Global Action Plan.

Source: Air Quality News, 1 February 2021.

Link: <https://www.globalactionplan.org.uk/clean-air/clean-air-day>

## Phase out scrubbers on ships

A new 36-page report from the International Council on Clean Transportation (ICCT), urges governments and the International Maritime Organization (IMO) to phase out all scrubbers. The study includes a comparison of the emissions associated with ships equipped with scrubbers using 2.6% sulphur heavy fuel oil (HFO) to ships without scrubbers using 0.7% sulphur marine gas oil (MGO).

Regarding air emissions, the results show that:

- SO<sub>2</sub> emissions from ships using HFO and scrubbers are on average 31% lower than from ships using MGO.
- PM emissions are nearly 70% higher using HFO with a scrubber compared with MGO.
- Black carbon emissions are 81% higher using HFO with a scrubber than using MGO in a medium-speed diesel engine and more than 4.5 times higher than using MGO in a slow-speed diesel engine.

The authors conclude that scrubbers are not equivalently effective at reducing total air pollution emissions compared to using MGO. Moreover, direct CO<sub>2</sub> emissions are 4% higher using HFO with a scrubber compared to MGO, and even though HFO has lower upstream emissions than MGO, the extra fuel consumption associated with powering the scrubber results in 1.1% higher CO<sub>2</sub> emissions on a life-cycle basis when using HFO.

Regarding water emissions, the study finds that:

- Scrubber discharges typically comply with IMO guidelines, but all scrubbers – open-loop, closed-loop, and hybrid – discharge water that is more acidic and turbid than the surrounding water. This contributes to ocean acidification and worsens water quality.
- All scrubbers emit nitrates, PAHs, and heavy metals that accumulate in the environment and food web and can negatively affect both water quality and marine life.

Given these findings, the ICCT recommends that individual governments continue to take unilateral action to restrict



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or prohibit scrubber discharges from both open-loop and closed-loop systems. This could include an immediate prohibition on scrubber discharges in ports, internal waters, and territorial seas. Internationally, the IMO should consider prohibiting the use of scrubbers on newbuild ships and phasing out scrubbers on existing ships, because scrubbers are not equivalently effective at reducing air pollution compared to using lower-sulphur fuels.

Source: ICCT, 24 November 2020.

The study: <https://theicct.org/publications/air-water-pollution-scrubbers-2020>

## Support for Mediterranean Emission Control Area

Experts, politicians and environmentalists who participated in a workshop organised by the German Nature And Biodiversity Conservation Union (NABU) agreed that the timeline to implement a Mediterranean Emission Control Area (ECA) for ships is lacking in urgency and scope of content.

While other ECAs implemented back in 2015 will now also cover emissions of nitrogen oxides, the current plan for the Mediterranean only covers sulphur dioxide and will not be effective before 2024.

French member of the European Parliament Catherine Chabaud called for stricter regulation of emissions from ships, noting that there should be ECAs for both SO<sub>2</sub> and NO<sub>x</sub>, not only for the Mediterranean Sea, but for all European waters.

Studies presented at the workshop showed that combined SO<sub>2</sub> and NO<sub>x</sub> ECAs will bring huge benefits to health, environment and the economy, concluded Sönke Diesener, Transport Policy Officer at NABU and coordinator of the MedECA NGO network.

Source: Safety4sea, 3 December 2020.

Link to workshop documentation: <https://en.nabu.de/topics/traffic/eca/index.html>

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# Recent publications from the Secretariat

Reports can be downloaded in PDF format from [www.airclim.org](http://www.airclim.org)



**Climate and Health** (September 2020). By Björn Fagerberg, Bertil Forsberg, Sofia Hammarstrand, Laura Maclachlan, Maria Nilsson and Anna-Carin Olin.



**Cost-benefit analysis of NOx control for ships in the Baltic Sea and the North Sea** (April 2017). By Katarina Yaramenka, Hulda Winnes, Stefan Åström, Erik Fridell.



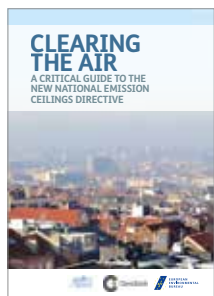
**Geoengineering technologies 2018/2019** (September 2020). By Fredrik Lundberg. Solar radiation management is not needed.



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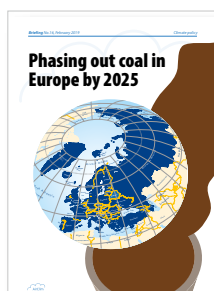
**What will it take to phase out greenhouse gas emissions from road traffic in the Nordic-Baltic region by 2030-2035?** (March 2018). By Mats-Ola Larsson. A conceivable scenario.



**Clearing the air** (Feb 2017). A critical guide to the new National Emissions Ceilings directive.



**Climate change and the Andean Cryosphere** (2019). By Catalina María Gonda. The cryosphere has unique functions and influences the physical, biological and social systems.



**Phasing out coal in Europe by 2025** (Feb 2019). By Fredrik Lundberg. An updated list of coal power stations throughout Europe and a proposal of phasing out coal by 2025.

## Coming events

**EU Environment Council.** Brussels, 18 March 2021. Information: [www.consilium.europa.eu/en/press/calendar/](http://www.consilium.europa.eu/en/press/calendar/)

**IMO PPR 8** (Sub-Committee on Pollution Prevention and Response). Remote meeting, 22 – 26 March 2021. Information: [www.imo.org](http://www.imo.org)

**International Transport and Air Pollution (TAP) Conference.** Remote meeting, 30 – 31 March 2021. Information: [tapconference.org](http://tapconference.org)

**CLRTAP Working Group on Strategies and Review.** Geneva, Switzerland, 17 – 20 May 2021. Information: [www.unece.org/env/lrtap/welcome.html](http://www.unece.org/env/lrtap/welcome.html)

**IMO 8th Intersessional Working Group on reduction of GHG emissions from ships.** Remote meeting, 24 – 28 May 2021. Information: [www.imo.org](http://www.imo.org)

**8th Global Nitrogen Conference (INI2021).** Remote meeting, 31 May – 3 June 2021. Information: <https://ini2021.com/>

**EU Green Week - Focus on "zero pollution ambition"**. 31 May – 4 June 2021. Information: [https://ec.europa.eu/info/events/eu-green-week-2021\\_en](https://ec.europa.eu/info/events/eu-green-week-2021_en)

**UN FCCC Bonn Climate Change Conference.** Bonn, Germany, 31 May – 10 June 2021. Information: <http://unfccc.int/>

**IMO Marine Environment Protection Committee (MEPC 76).** Remote meeting, 10 – 17 June 2021. Information: [www.imo.org](http://www.imo.org)

**EU Environment Council.** Luxembourg, 21 June 2021. Information: [www.consilium.europa.eu/en/press/calendar/](http://www.consilium.europa.eu/en/press/calendar/)

**CLRTAP EMEP Steering Body + Working Group on Effects.** Geneva, Switzerland, 13 – 17 September 2021. Information: [www.unece.org/env/lrtap/welcome.html](http://www.unece.org/env/lrtap/welcome.html)

**Youth4Climate: Driving Ambition.** Milan, Italy, 28 – 30 September 2021. Information: <https://www.minambiente.it/pagina/towards-cop26-pre-cop-and-youth-event-youth4climate-driving-ambition>

**PreCop26.** Milan, Italy, 30 September – 2 October 2021. Information: <https://www.minambiente.it/pagina/towards-cop26-pre-cop-and-youth-event-youth4climate-driving-ambition>

**Air Pollution threats to Plant Ecosystems Conference.** Paphos, Cyprus, 11 – 15 October 2021. Information: <http://www.ozoneandplants2020.com>

**IMO 9th Intersessional Working Group on reduction of GHG emissions from ships.** London, UK, 18 – 22 October 2021. Information: [www.imo.org](http://www.imo.org)

**IMO Marine Environment Protection Committee (MEPC 77).** London, UK, 1 – 5 November 2021. Information: [www.imo.org](http://www.imo.org)

**UN FCCC COP26.** Glasgow, UK, 1 – 12 November 2021. Information: <http://unfccc.int/>

**2021 Global Conference on Health and Climate Change.** Glasgow, UK, 6 – 7 November 2021. Information: <https://www.who.int/news-room/events/detail/2021/11/06/default-calendar/2021-global-conference-on-health-and-climate-change>

**CLRTAP Executive Body.** Geneva, Switzerland, 6 – 10 December 2021. Information: [www.unece.org/env/lrtap/welcome.html](http://www.unece.org/env/lrtap/welcome.html)

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